INTERAVIA

REVIEW OF WORLD AVIATION

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U.S.A.:	80 cents
British Isles:	3 s
Switzerland:	Fr. 2.80
Netherlands:	Fl. 2.50
Denmark:	Cr. 5.-
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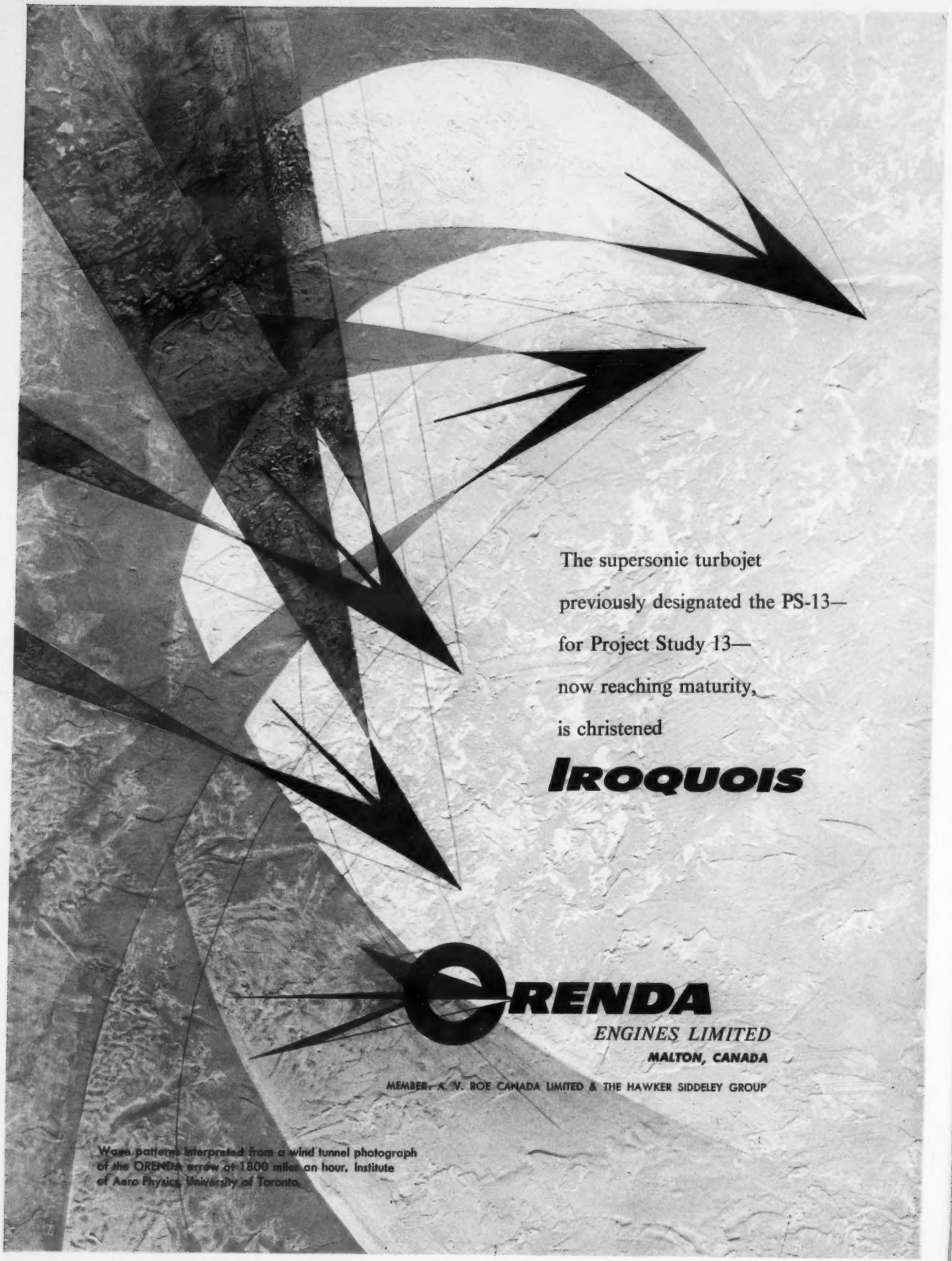
FARNBOROUGH — EDINBURGH

VOLUME XI 9 SEPTEMBER 1956



The supersonic turbojet
previously designated the PS-13—
for Project Study 13—
now reaching maturity,
is christened

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Wave patterns interpreted from a wind tunnel photograph of the ORENDA arrow at 1800 miles an hour. Institute of Aero Physics, University of Toronto.

INTERAVIA

Review of World Aviation

Volume XI No. 9 September 1956

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Front Cover :

The central area of London Airport as seen from a helicopter : control building (foreground), Queens Building (behind it to the left) and Southeast passenger terminal. British European Airways' maintenance hangar is in the rear.

Appears Monthly in Four Editions : English, French, Spanish and German.

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Advertising Department, Publishing and Editorial Offices, Subscription Department : Interavia S.A., 6, Corraterie, Geneva. Telephone : 25 42 34 (five lines. Cables and Telegrams : Interavia-Geneva. Teleprinter : 2 21 22. Postal Cheque Account : Geneva I 5380.

Annual Subscriptions : U.S.A. and Canada, U.S. $7.00; United Kingdom and Eire, £1.15.0; Commonwealth, £2.6.0 ; Switzerland, 28.— fr. ; Austria, 170.— sch. ; Belgium, 320.— fr. ; Denmark, 48.— Kr. ; France, 2400.— fr. ; Germany, 27.50 DM ; Holland, 25.— fl. ; Italy, 40€0.— L. it ; Japan, U.S. $7.00 ; Latin American countries, U.S. $7.00 ; Norway, 50.— kr. ; Spain, 280.— ptas.; Sweden, 35.— kr. All other countries, 28.— Sw.fr.

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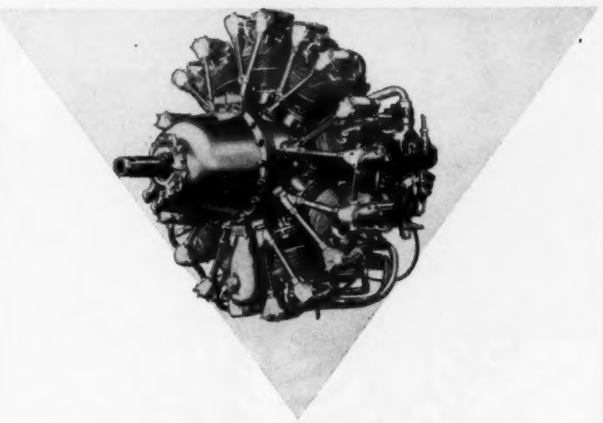

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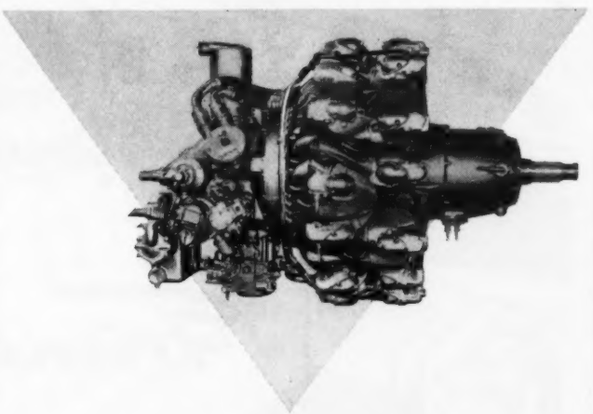
the power plant of the
Scottish Aviation
Twin Pioneer



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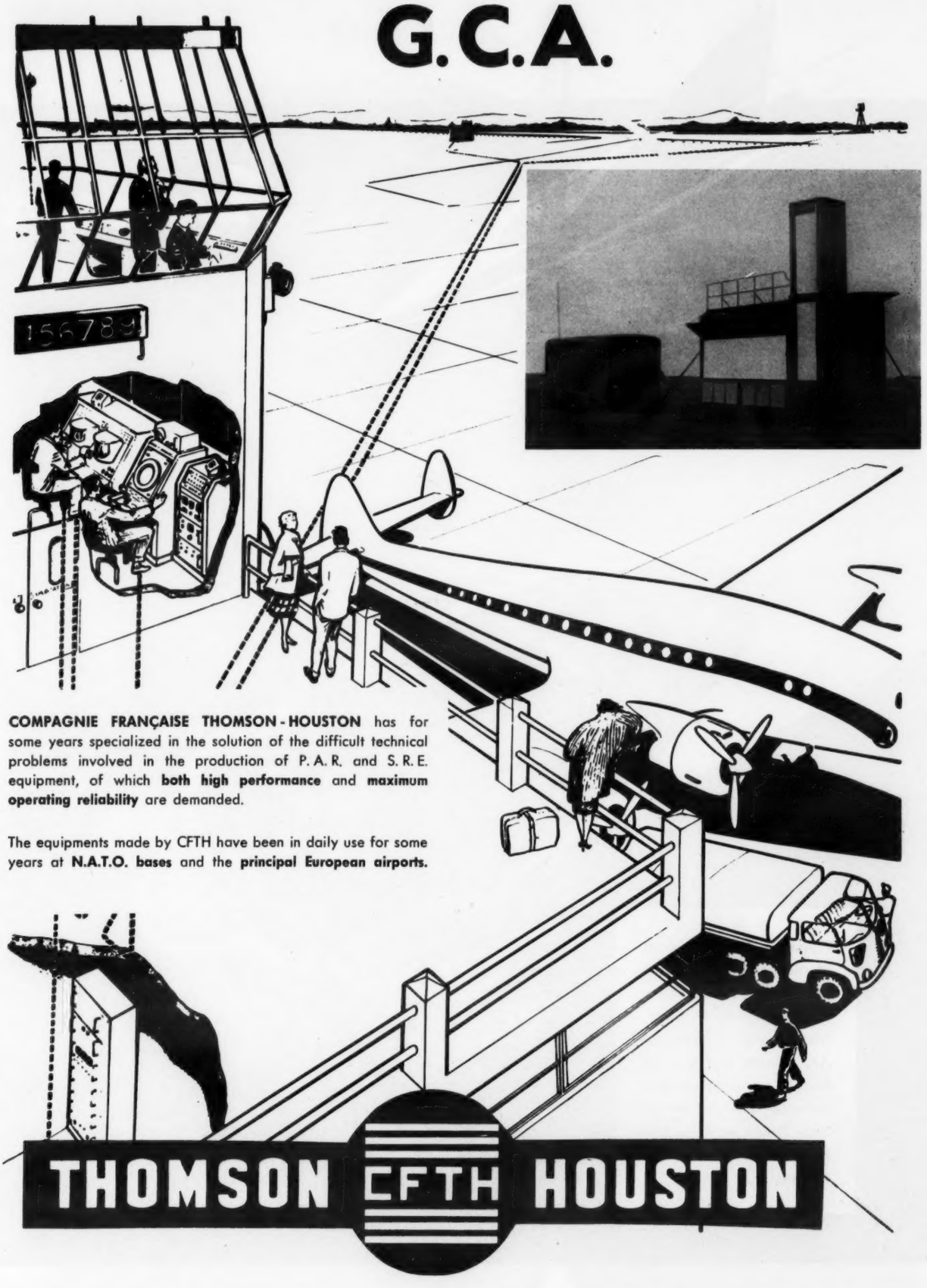

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the F-104A

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The faster-than-thought speed of the Lockheed F-104A Starfighter has been made practicable by the automatic flight control system designed and produced by Lear in collaboration with Lockheed engineers. By damping out undesired oscillations in *all* axes more quickly than they can even register in a pilot's brain, Lear's 3-axis stability augmenter provides an ease of control comparable to a basic jet trainer.

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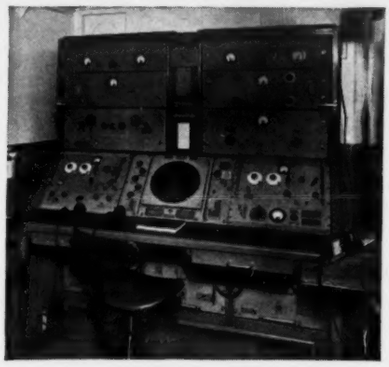
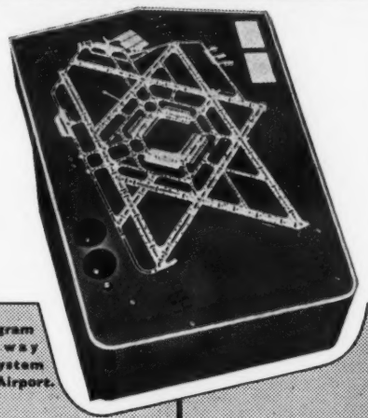


Automatic CRT Direction finding equipment PV.1-B

B.E.A. 'Viscount' with 'SenTerCet' Starter Truck.

Part of the *Standard* radio installation for the Viscount.

Manual switchboard of Ministry of Transport and Civil Aviation PABX at London Airport.



Mimic diagram for runway lighting system at London Airport.

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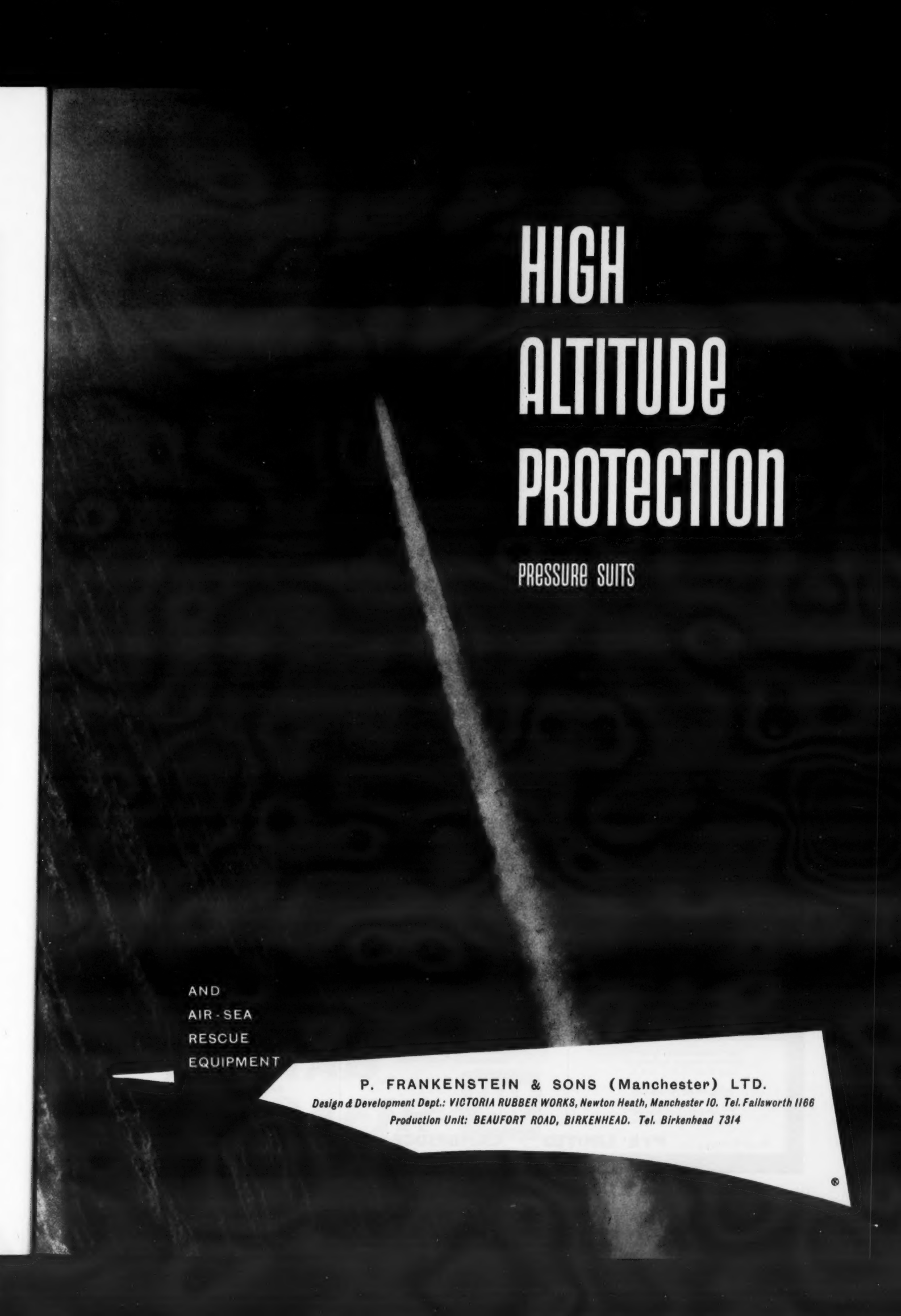
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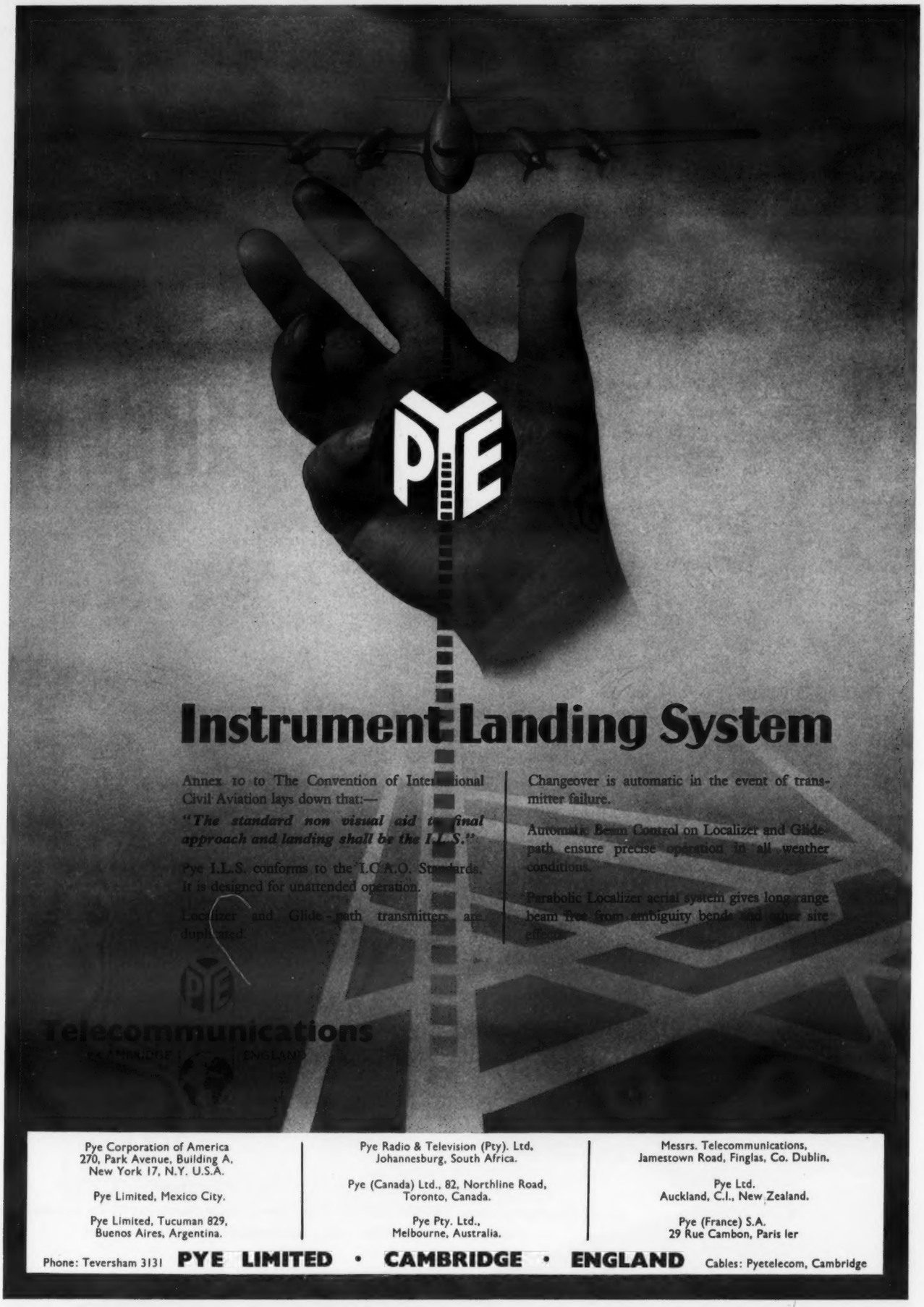
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"The standard non visual aid to final approach and landing shall be the I.L.S."
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Norway Orders Saab Safirs

for Air Force Training

The Royal Norwegian Air Force (" Flyvåpnet ") recently signed a contract with the Saab Aircraft Company for the supply of a substantial number of Saab-91 B-2 Safir trainers.

All initial flying training within the Norwegian Air Force will in the future take place on this Swedish aircraft.

Thanks to its excellent flight characteristics, the Saab Safir can be used as the only piston-engined trainer up to the advanced jet training stage, as is now the case in the Royal Swedish Air Force. However, the Safir is not only in large-scale use as a military trainer, it has also attained a rather unique position as a trainer for airline pilots.

The SAAB SAFIR
is now being used
as a trainer by the following
organizations:

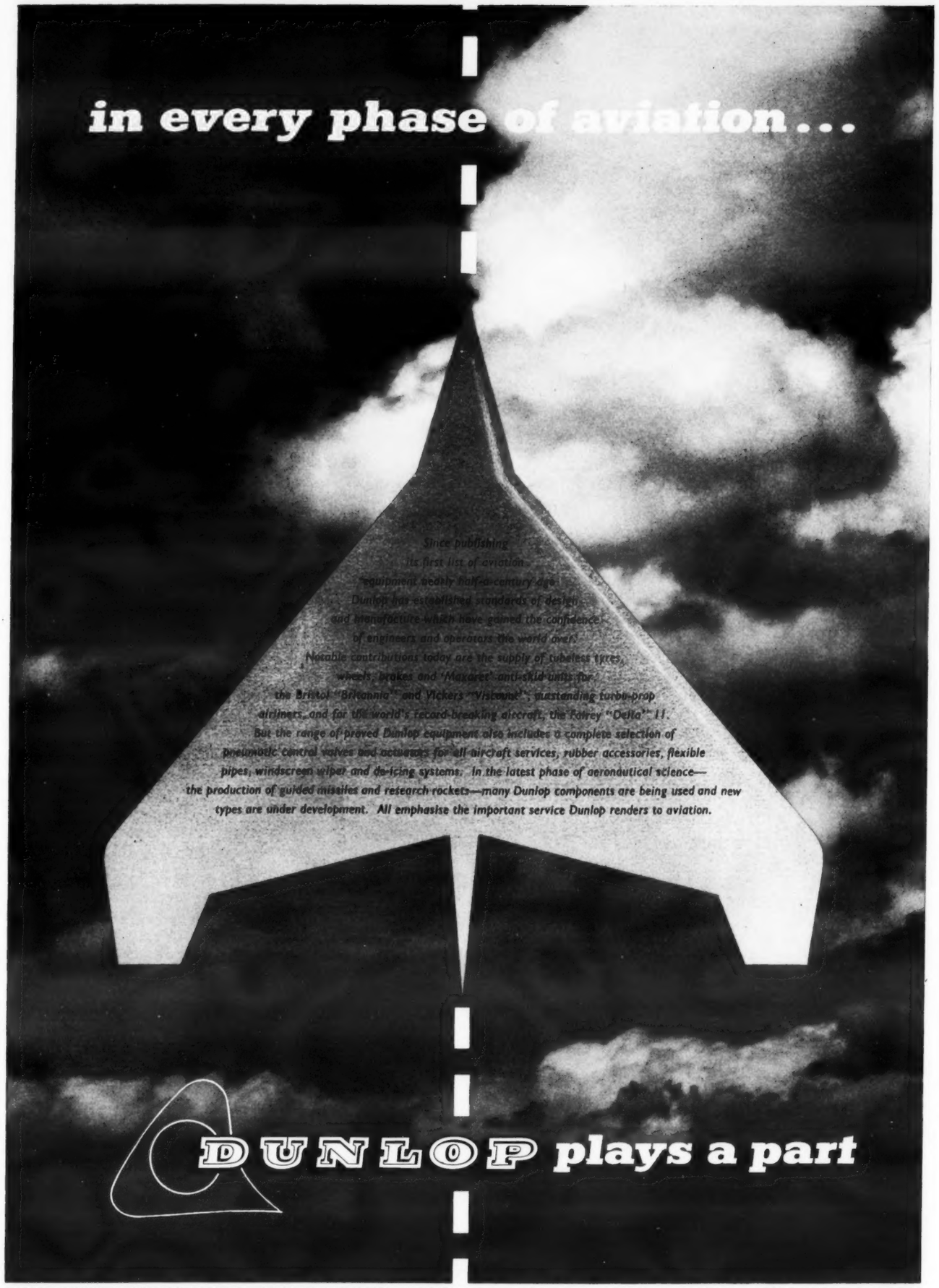
The Royal Swedish Air Force
The Imperial Ethiopian Air Force
Rijksluchtvaartschool of Holland
Deutsche Lufthansa
Sabena Belgian World Airlines
Air France
The Indonesian Government's
Civil Flying Training School

The SAAB SAFIR

SAAB

in service
in 17
countries

SVENSKA AEROPLAN AKTIEBOLAGET (Saab Aircraft Company) - LINKÖPING - SWEDEN


in every phase of aviation...
Since publishing its first list of aviation equipment nearly half-a-century ago, Dunlop has established standards of design and manufacture which have gained the confidence of engineers and operators the world over.
Notable contributions today are the supply of tubeless tyres, wheels, brakes and 'Maxaret' anti-skid units for the Bristol "Britannia" and Vickers "Viscount", outstanding turbo-prop airliners, and for the world's record-breaking aircraft, the Fairey "Delta" II.
But the range of proved Dunlop equipment also includes a complete selection of pneumatic control valves and actuators for all aircraft services, rubber accessories, flexible pipes, windscreen wiper and de-icing systems. In the latest phase of aeronautical science—the production of guided missiles and research rockets—many Dunlop components are being used and new types are under development. All emphasise the important service Dunlop renders to aviation.
DUNLOP plays a part

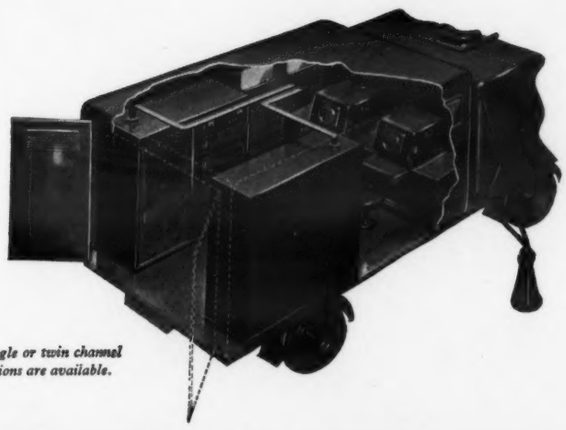
DUNLOP RUBBER COMPANY LIMITED (AVIATION DIVISION) · FOLESHILL · COVENTRY · ENGLAND · DEPOTS THROUGHOUT THE WORLD

6X/55

COSSOR radar type 21

with M.T.I.

The Aerial Head, jack-supported, is suitable for mobile, tower or roof mounting. A Secondary Radar aerial can be mounted on top of the scanner, as shown here.



Either single or twin channel installations are available.

To be shown at Farnborough this year — a new Cossor high-power S-band surveillance radar, complete and self-contained in a single trailer. The Type 21 is a high-definition radar with a vertical coverage of 0-45° without beam tilting or switching. Moving target indication is provided and is fully controllable. Anti-rain facilities, including circular polarisation, are provided. All equipment is shock-mounted for rough terrain, and the cabin accommodates two operators and a technician. Peak power: 500KW.

Accessibility: The magnatron, like all major units, is readily accessible.

Each electronic chassis is serviced from the front — whilst operating.

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Douglas M-2 (upper left) made its first flight in 1926. The DC-8 (above) can cruise at speeds over 580 m.p.h. with a full passenger load.

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Thirty years ago when the Douglas M-2 was one of the hottest planes in the air, Fuller was serving the aircraft industry.

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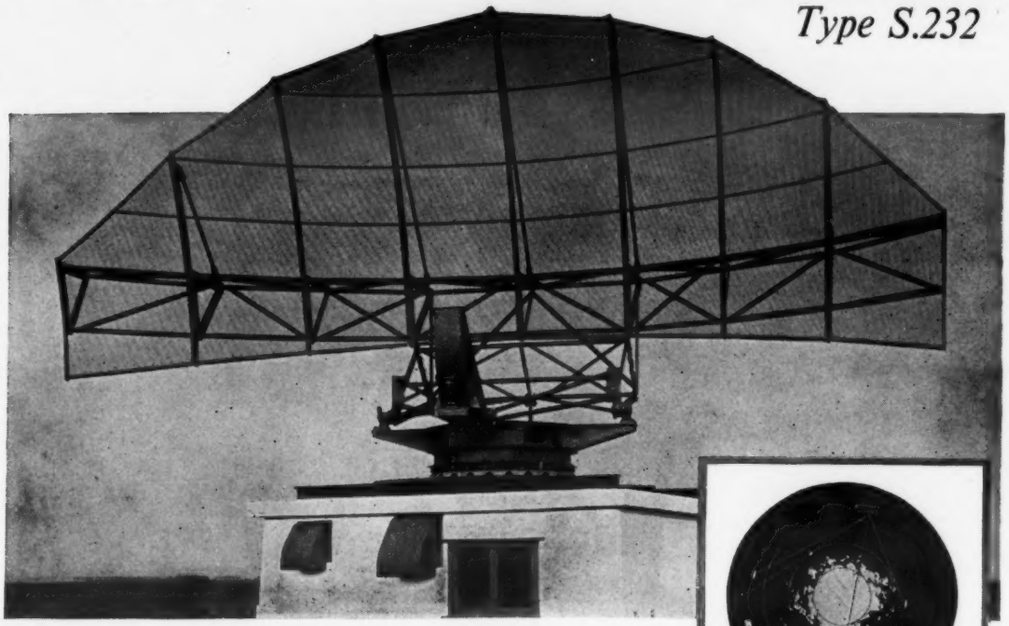
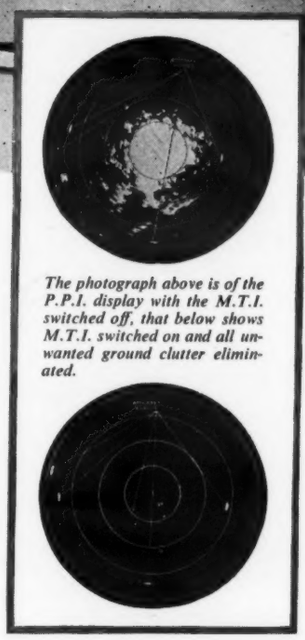
Marconi Airfield Control Radar

Type S.232





The photograph above is of the P.P.I. display with the M.T.I. switched off, that below shows M.T.I. switched on and all unwanted ground clutter eliminated.

OPERATES AT FULL EFFICIENCY IN ALL WEATHERS

The S.232 operates in the 50 cm. band using a wavelength which is long enough to be unaffected by cloud and rain. This also gives more efficient radiation from the aerial system, thus longer ranges can be achieved for the same power output and aerial gain than with short wave lengths.

CUTS OUT 'PERMANENT ECHOES' FROM MOUNTAINS, BUILDINGS, ETC., WHICH OBSCURE AIRCRAFT RESPONSE

Unwanted ground clutter can be eliminated in the S.232 by an extremely efficient Moving Target Indicator (M.T.I.) system which feeds only echoes from moving objects to the display.

IS INSTANTLY OPERATIONAL AT ITS RATED PERFORMANCE

The S.232 is crystal controlled and the equipment can be switched on without any subsequent tuning. The M.T.I. system needs no time to settle down.

Marconi Ground Radar is used by 18 Air Forces.

Lifeline of Communication

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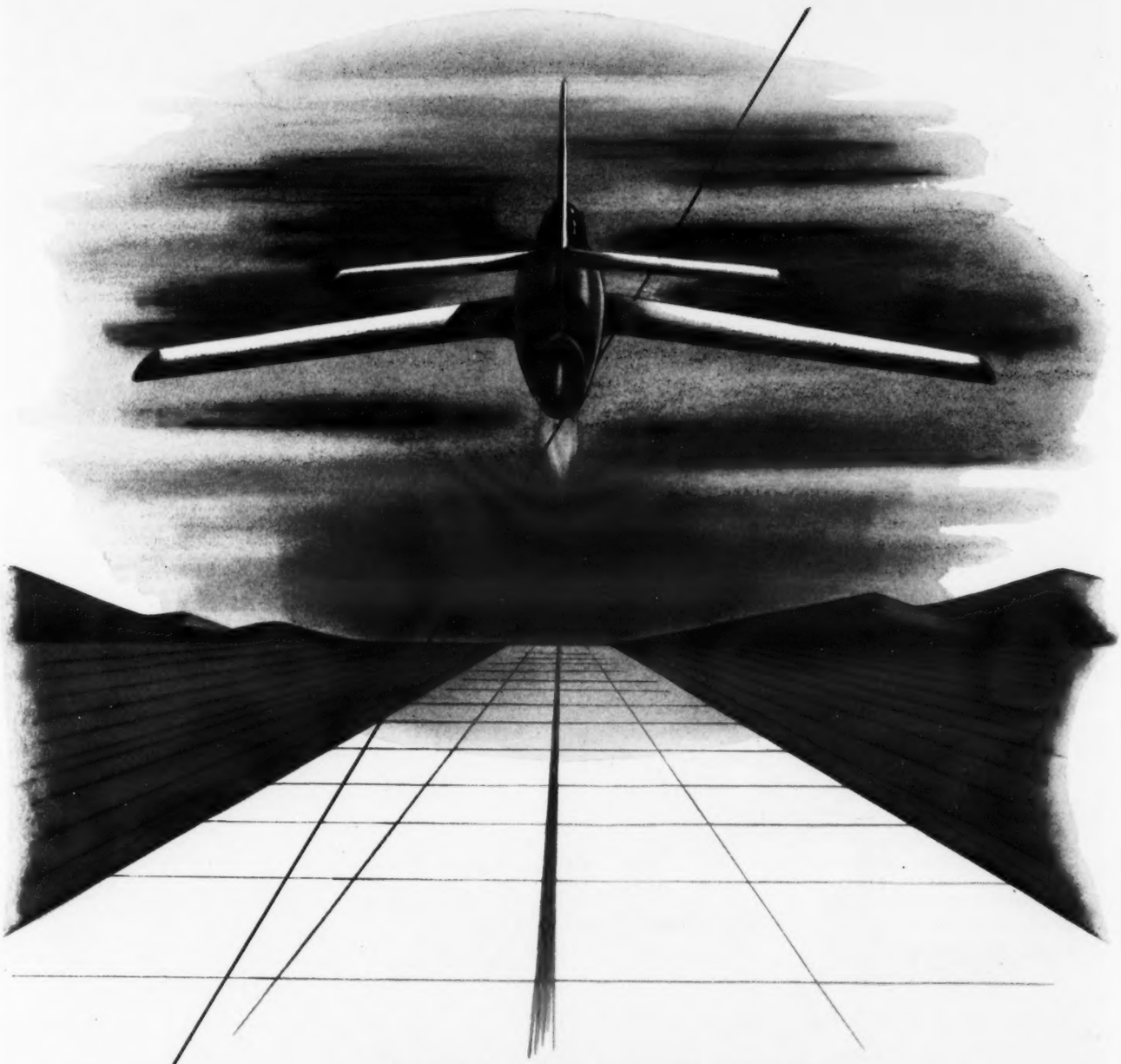

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CONTRAVES ITALIANA S. p. A. ROMA

INTERAVIA

Deadline Notes

No. 9, 1956

THE SOVIET AIR FORCE is substantially reinforcing its strength in North Eastern Siberia in the regions adjoining the American Continent. Nearly 50 air bases, airfields and landing strips are known to exist on Chukotski Peninsula, which is separated from the American Continent only by the 56-mile-wide Bering Strait. The main air base is at Provideniya on Provideniya Bay. Below Chukotski Peninsula a close network of military airfields also extends along the shores of the Bering Sea, opposite Alaska. It stretches through such centres as Anadyr, Opuka and Ust Kamchatsk, then south to Petropavlovsk, where one of the major Russian Army-Navy-Air Force bases in the Far East is established.

THE BRITISH ATOMIC TESTS at the Maralinga testing ground, South Australia, this month will involve the explosion of four atomic devices, at intervals of about ten days. The first two will be fired from towers. These will be the biggest explosions, but they will be no more powerful than a "few ten thousands of tons of TNT". The third will be an "operational weapon of a service type" and will be dropped from a Valiant bomber. It will be of small explosive power. The fourth will be detonated on the ground, and this will be the first such explosion by British scientists. The ground burst is designed to study the effect of nuclear explosions on military equipment, housing etc., as well as civil defence measures. The tests will be directed by Sir William Penney, Director of the Atomic Weapons Research Establishment, Aldermaston, England.

PROCUREMENT OF AIRCRAFT for the West German Air Force has now begun. After taking over its first aircraft (29 Harvard Mk. 4s and 20 Piper L-18Cs) from the U.S. Air Force, the Government placed orders at the beginning of August with Bristol Aircraft Ltd. for 50 Bristol 171 Sycamore helicopters, with Fairey Aviation Co. Ltd. for 16 Gannet anti-submarine aircraft and with Armstrong Whitworth Aircraft Ltd. for 68 Sea Hawk Mk. 4s. Deliveries of Sycamores are to begin before the end of the year, and of Gannets in 1958. Delivery contracts have also been signed with the German aircraft industry.

THE U.S. AIR BASE AT TORREJON, Spain, is making good progress. The 2 1/2-mile long main runway is nearing completion and should be ready for use by October 1st. Still to be built are accommodation for personnel, supply tanks for aviation fuel, a number of operational buildings and an approach road. The main difficulty encountered in constructing the base is that of the water supply, since water will have to be brought through a 4-mile pipeline from the Jarama river. Construction of this pipeline began early in August.

MARCONI ESPANOLA S.A. has received a Government contract for the manufacture of radar equipment for defence purposes. A decree published in the Boletin Oficial announces a credit of 40,000,000 pesetas, to be distributed as follows: 9,000,000 pesetas for the construction of factory premises on the land owned by Marconi near Villaverde; 8,000,000 pesetas for the purchase and installation of the necessary production equipment and instruments; 3,000,000 pesetas for the training of Spanish technicians and the employment of foreign specialists; 20,000,000 pesetas for the development and manufacture of the radar equipment selected by the Government.

DEUTSCHE LUFTHANSA has chosen Rolls-Royce Conway by-pass turbojet engines to power the four Boeing 707 airliners it has on order. Both Boeing and Douglas offer their jet transports with either American or British engines.

SIR RICHARD FAIREY, founder of Fairey Aviation Co. Ltd., has resigned office as Managing Director, though he will continue as Executive Chairman. He has been replaced as Managing Director by Geoffrey W. Hall.

DOUGLAS AIRCRAFT CO. recently delivered the 700th aircraft of the DC-6 and DC-7 series. Total value of these deliveries exceeds $750,000,000. The backlog for DC-6 and DC-7 type airliners now totals 294, valued at $500,000,000. Monthly production rate is to be stepped up from the present 10 to 15 by the spring of 1957.

THE CONVAIR DIVISION of General Dynamics has so far sold a total of 111 Convair 440 Metropolitans worth approximately $100,000,000. New orders for 25 Metropolitans placed by U.S. and foreign airlines will ensure Convair 440 production until mid-1957.

* From INTERAVIA's world-wide news service, including INTERAVIA AIR LETTER, the daily international aviation news digest. — No part may be reproduced without written permission.

COST OF U.S. MILITARY AIRCRAFT: According to recent official statements the unit price of the Douglas A4D-1 Skylark Navy low-level attack aircraft is $385,820, plus $149,675 for spares and unit support. The Douglas A3D-2 Skywarrior costs $2,715,103, including $840,446 for spares and maintenance equipment. The price of the Chance Vought F8U-1 Crusader is $1,043,041, including $342,237 for spares; that of the Martin P6M-1 SeaMaster four-jet flying boat is $7,900,000, of which $2,350,000 is for spares and unit support. A Canadair Sabre VI costs approximately $340,000, and an Avro CF-100 twin-jet all-weather fighter $700,000, both including spares.

A JET AIRLINER for 200 passengers which will operate at a max. speed of 1,500 m.p.h. and altitude of 50,000 ft. is forecast for 1975 by Wellwood E. Beall, Senior Vice-President of Boeing Airplane Co. Writing in the special issue of "Boeing Magazine" which commemorates the company's 40th anniversary, he asserts that Boeing 707 jet transports, which will become operational in 1959, should maintain their position as the "finest commercial aircraft" for at least 15 years. Other points from his article "What about the next Forty Years?" are: "I do not think it would be practical within the next 40 years to build a faster commercial jet transport (than the one forecast for 1975). It may be possible technically, but not economically. A further step in supersonic intercontinental transports, some time beyond the year 2000, could be a rocket. However, by that time the human race may have a new set of values and no longer be greatly interested in seeing how fast it can run on our earth-bound treadmill. I have considerable hope that long before we turn to commercial passenger rockets we will have devised a better method of getting from one city to another. This may be accomplished in 15 or 20 years by airplanes flying little faster than our initial family of 707 jet transports, but very different from them in take-off and landing characteristics. One of the most promising areas for time-saving is not in flight time but in time spent between city centre and airport. A traveller flying at 1,500 m.p.h. from Seattle to San Francisco could make the flight in 30 minutes, but he would spend an additional two hours between city centres and his airplane . . . What we will need eventually - and what I think we will have - are subsonic passenger airplanes that can take off and land in city centres. Perhaps these airplanes will be able to take off and land vertically from the roof of a building. Or they may require only a very short landing strip, which could be provided by a deck built over an unobstructed freeway or over the tops of several buildings."

DEUTSCHE LUFTHANSA has now reopened services to South America after an interruption of seventeen years. The service is flown twice weekly from Hamburg via Düsseldorf-Frankfurt-Paris-Dakar-Rio de Janeiro-Sao Paulo to Buenos Aires. Equipment: Lockheed L-1049G Super Constellations. Federal Transport Minister Dr. Seebohm and Federal Posts and Telecommunications Minister Dr. Balke took part in the official inaugural flight.

PAKISTAN INTERNATIONAL AIRLINES has opened a central reservation control office in Karachi which eliminates the previous 30-hour time lag between requests for bookings and confirmation. Thus a P.I.A. ticket office in London is now able to confirm immediately a booking from Dacca to Lahore, for example. For use in conjunction with the central reservation control office, P.I.A. has contracted for a 2,800-mile domestic teleprinter system, and has already been given exclusive use of a radio teleprinter circuit connecting Karachi to Dacca. The new reservation system applies to all domestic and international services with the exception of the west-bound Karachi-London run.

WORKSHOP BRIEFS . . .

The U.S. Army has awarded contracts for heavy "flying crane" type helicopters to Flettner Aircraft ($39,600), Kaman Aircraft ($41,800), Piasecki ($58,800), Hughes Tool Co. -Aircraft Division ($54,700) and Hiller ($70,000). * The first Douglas AD-7 Skyraider has been taken over by the U.S. Navy. Power plant Wright R-3350-26WB. The AD-7 is the 50th version of the Skyraider to be built since the first prototype made its first flight in March 1945. * Hunting Percival President, the civil counterpart of the Pembroke, is available in three versions: as a feeder airliner, a business aircraft or for aerial survey. * Icarus B12 is reported from London to be the designation of a light-weight supersonic fighter of Yugoslav design, to be fitted with a Bristol Orpheus turbojet. * The following details of the medium-haul Britannia (Series 320) offered by Bristol Aircraft Ltd. for 1958 are announced: guaranteed cruising speed 400 m.p.h.; max. payload 28,000 lbs. over stages of 200 to 2,600 miles; four Proteus 755 turboprops. Cabin for 73 passengers in the first-class arrangement, plus a rear lounge for six passengers. Tourist layout provides accommodation for 93 passengers with a basic five-abreast seating, while 133 passengers can be carried when a six-abreast seating arrangement is chosen. * The Polish TS-8 all-metal low-wing elementary trainer has a 320 h.p. radial engine, two-blade v.p. propeller and retractable nose-wheel undercarriage. The two seats are arranged in tandem. * The second prototype of the Flug- und Fahrzeugwerke AG's FFA P-16 single-jet combat aircraft exceeded Mach 1 in a shallow dive during its test flights. * Beech 95 Badger, a new twin-engine four-seat touring aircraft, has begun flight testing; the first Badgers will be ready for delivery early in 1957. Two 180 h.p. Lycoming engines; price between $35,000 and $55,000. * According to East German sources, the Russian Kamov KA 10 small helicopter is now in large-scale production in the U.S.S.R. The KA 10 is a single-seater with 50 h.p. engine. * North American Aviation has completed first test flights in the two-seat F-100F Super Sabre. The F-100F is substantially larger than the single-seat versions of the Super Sabre. * The Convair F-102B all-weather fighter has been renamed the F-106A.

* * *

GETTING THINGS DONE

These days it goes without saying that an aircraft plant must be well equipped to stay in business. The competitive nature of the industry as well as the complexity of the finished product make first-rate plant facilities an essential factor in its success. Where companies do differ is in the *way* their equipment is used—how they get on with the job—the planning and thinking they do before the wheels are turned.

At Canadair such thinking is reflected in rigid cost control, production planning, schedule controlling, engineering imagination, standards set for close tolerance work and, of course, the broad band of supervision which, from top to bottom of the organization, "gets things done".

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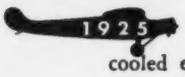
KLM opens the first air traffic booking office in the world.



KLM is the first to make use of air-cooled engines and all-metal propellers, also since 1920 the first to introduce to the world the Fokker passenger planes which later on became the most widely used commercial aircraft in the world.

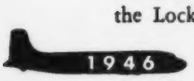
1927 KLM makes the world's first intercontinental charter flight: Amsterdam-Jakarta and -Khartoum.

KLM opens the longest air route in the world of that time: Amsterdam-Jakarta.

KLM, as first airline outside the U.S., introduces the all-metal DC-2, wins the London-Melbourne Air Race handicap section.

1936 KLM is the first European company to purchase the world's most widely sold commercial aircraft: the DC-3.

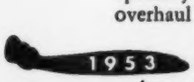
1943 KLM, as first non-U.S. carrier, orders the Lockheed Constellation.



KLM, despite its war-shattered organization, is the first European airline company after the war to open a regular Trans-atlantic service to New York.

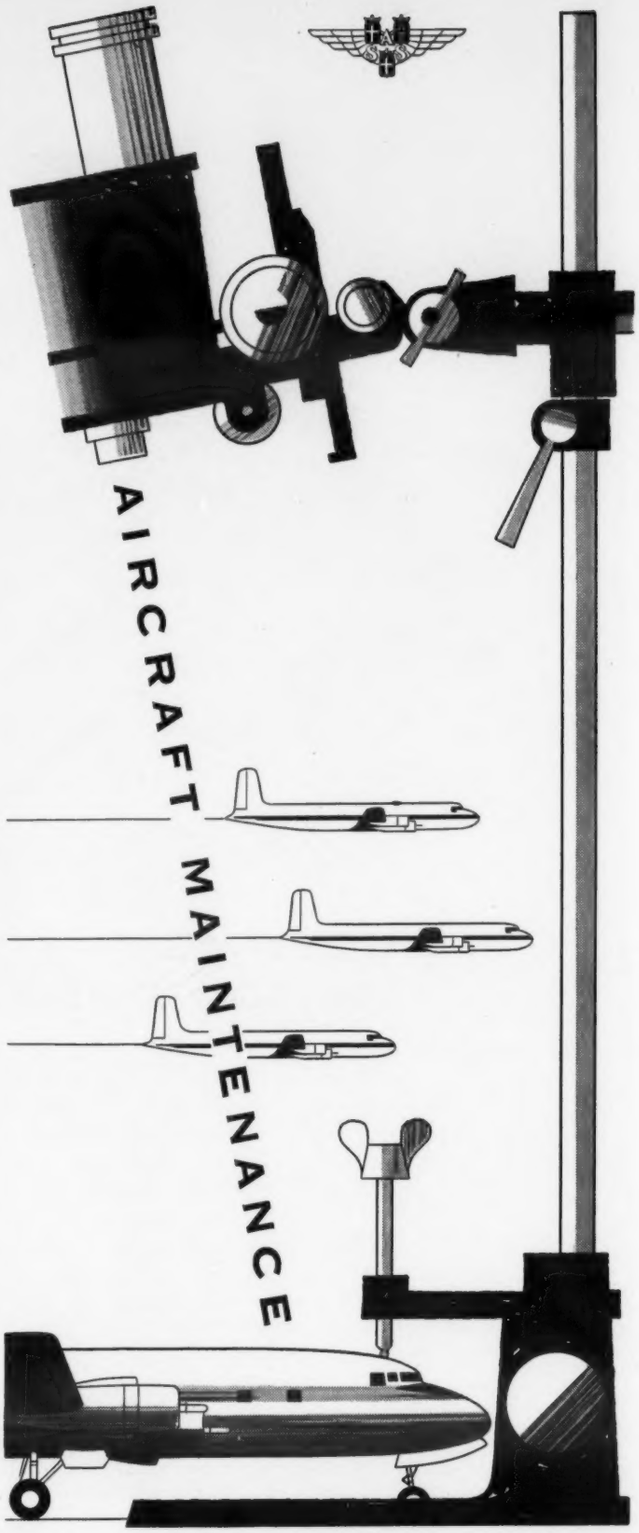
1948 KLM is the first European company to put the Convair Liners into service.

1950 KLM is the first European airline to be specially authorized by the U.S. Government to overhaul aircraft of U.S. airlines.



KLM is the world's first airline to operate the turbo compounded Lockheed Super Constellations.

KLM
ROYAL DUTCH AIRLINES



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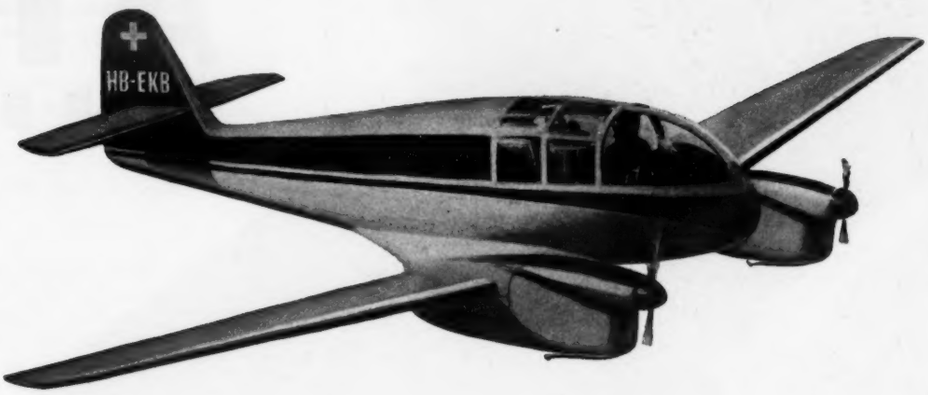

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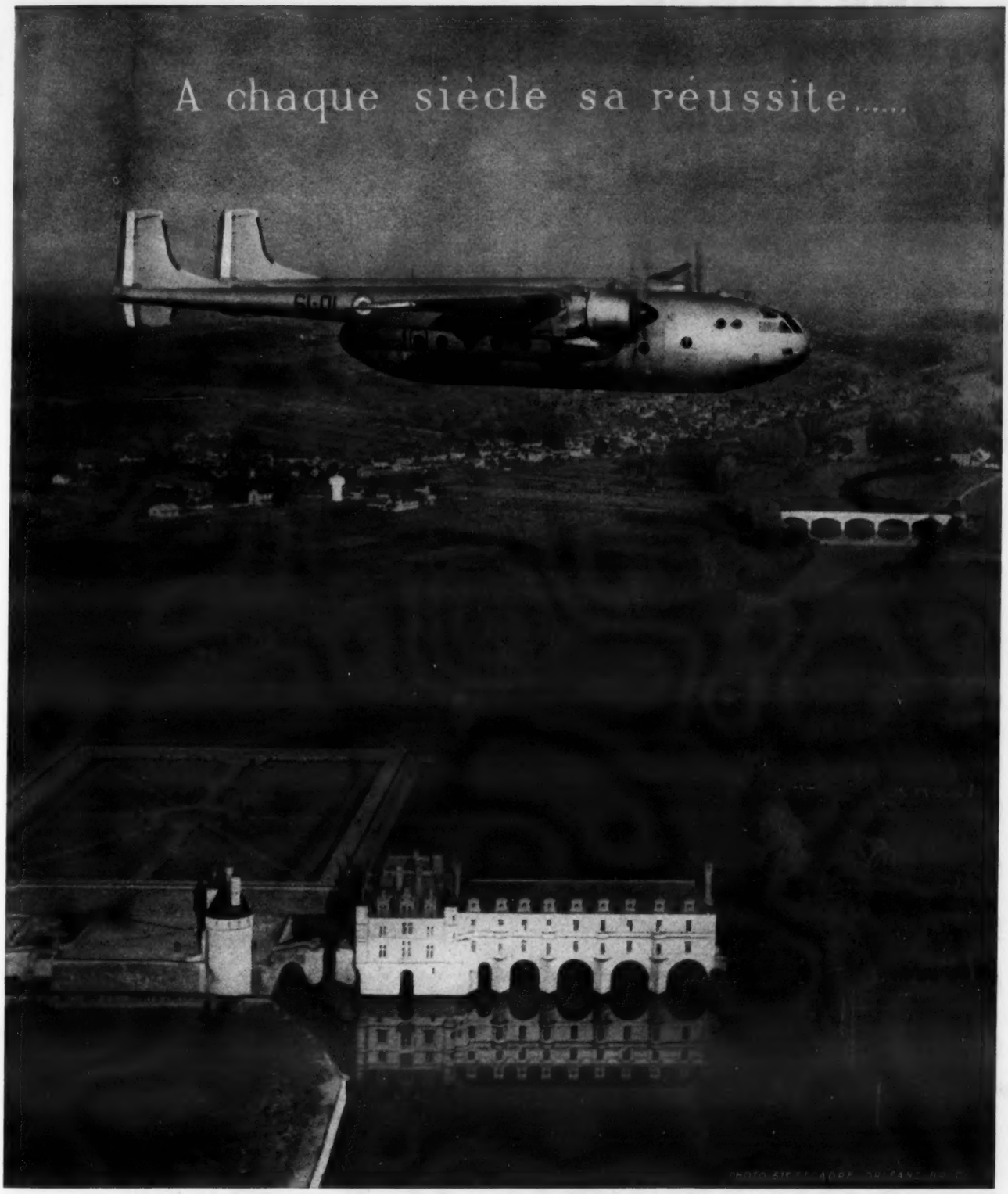

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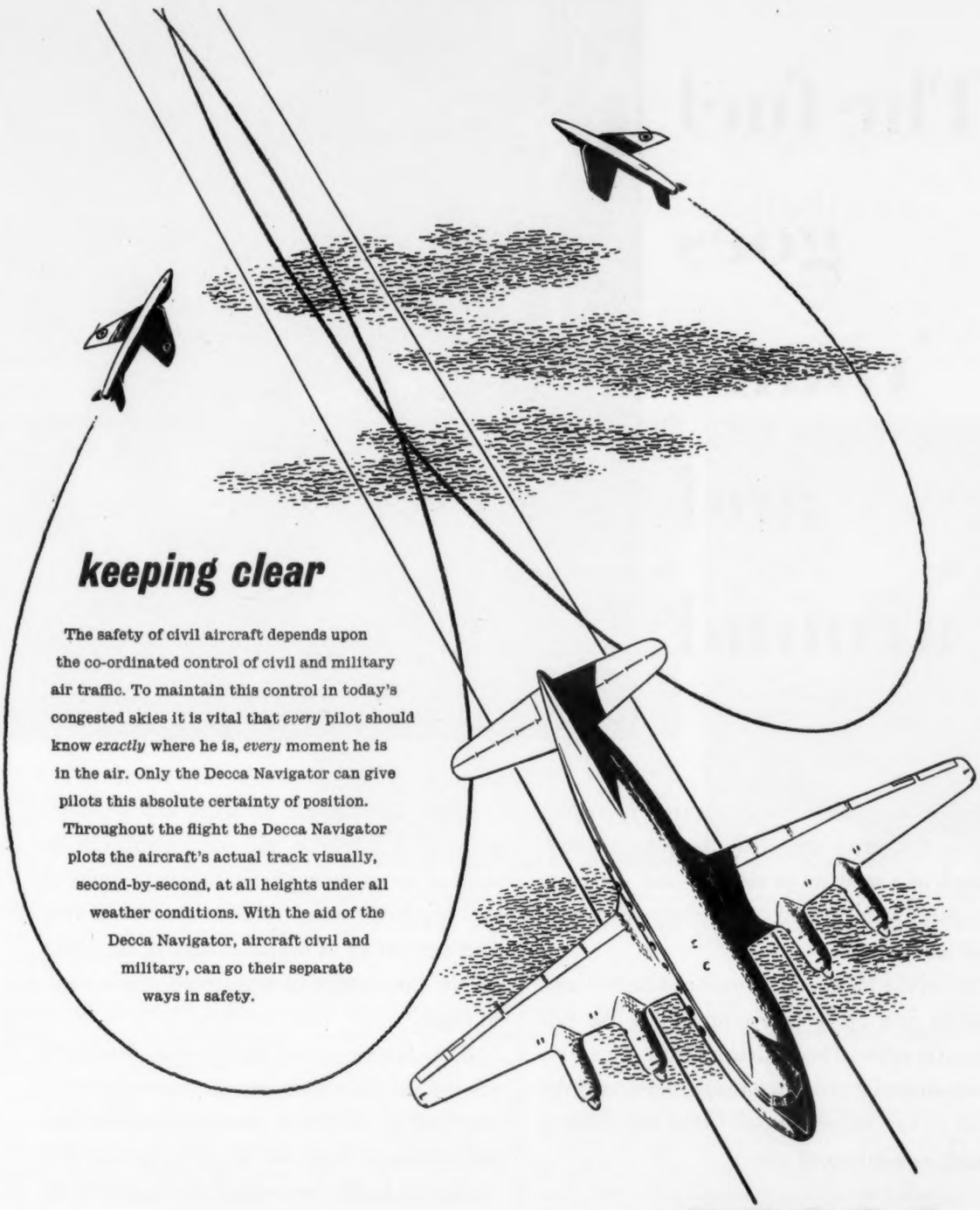

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From the tanks can be pumped fuel at any desired rate up to that representing the full throttle take-off condition. Into it can be pumped simultaneously enough fuel to keep the level at any required point—thus maintaining steady conditions of test.

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If the test rig proves that the calculations of the ENGLISH ELECTRIC test team were correct—well and good. If not—how much better that defects should be shown up on the ground than in the air! In this open-minded atmosphere the long, costly and elaborate testing on the ground does a lot to shorten the much longer, and certainly more dangerous, process of trial and error in the air.

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British Aviation and the World Situation

August 7th, 1956.—In just under four weeks the annual S.B.A.C. Flying Display and Exhibition, at which the British aircraft industry sets itself the task of demonstrating its progress year by year to the aviation world, will open at Farnborough. And roughly six weeks from now will take place that other important event which gives the International Air Transport Association an opportunity each year to review the achievements of the previous twelve months and to paint for the public a picture of future air transport which becomes more brilliant from year to year.

At the moment, however, the British organizers of both events and their guests are probably more preoccupied with the strip of sand in the Middle East which forms the banks of the Suez Canal. This is not the place to make political forecasts. But it needs little imagination to picture what the economic consequences of Colonel Nasser's *coup de main* of July 26th must be unless the future of this "maritime pipeline" is safeguarded for the whole Western world. The boom in air transport would be somewhat rudely interrupted if the fuel that now flows from the Arabian oilfields through the Canal became scarce. And the aircraft industry would probably have more urgent problems to solve than showing the fruits of its past labours to distinguished military guests, engineers and curious spectators. Developments in the Middle East might well have a decisive influence on its programme.

As if the aviation world and along with it the British aircraft industry did not have enough problems even before July 26th!

*

If we are not mistaken, it was the French *couturier* Christian Dior who gave the women of the world a "New Look" immediately after the war. The expression caught on and has become almost a plague in the discussions on strategic concepts of recent months. Only yesterday, on August 6th, the military correspondent of a highly reputed Western European newspaper wrote about a "second military New Look." Those military planners who have been able to keep a reasonably clear head in the face of so many New Looks must be feeling some concern. At any rate apparent mathematical wizards among strategists and financial experts have succeeded in creating a pretty state of confusion; since mid-July they have been promising "increased security for less money" . . . thus squaring the circle.

*

It all actually started with a "trial balloon" sent up by Special Correspondent Anthony Leviero in the "New York Times" of July 12th. Obviously acting as spokesman for a group of opposition officers and worried congressmen, he made a journalistic scoop that many of his colleagues will envy him: Admiral Arthur W. Radford, Chairman of the Joint Chiefs of Staff, had, he maintained, worked out plans for a complete reorganization, including a numerical reduction in the armed services from 2,800,000 officers and men to 2,000,000. All services, including the U.S. Air Force, would be affected, but in particular the Tactical Air Command, which would be cut by 150,000 men. The Air Force as a whole, which is scheduled to reach a strength of 936,000 in 1957, would be reduced to 820,000 by 1960. Main emphasis would be placed on atomic warfare, initially with long-range bombers and later with guided missiles as the

Chancellor of the Exchequer Norman MacMillan regards Britain's defence budget, with its double expenditure on atomic and conventional armament, as economically indefensible. He advocates a preponderantly aero-nuclear force.

Secretary of State for Air Nigel Birch, who sees the Royal Air Force's tactical units in danger under the strategic New Look, is more likely to be in favour of balanced air forces with both atomic and conventional weapons.

carrying vehicles, and above all a sharp reduction in the production and maintenance of conventional weapons and aircraft.

Was this merely a *canard?* At any rate it was officially announced at the beginning of July that appropriations of approximately $ 16,500,000,000 for the U.S. Air Force had been approved for the 1957 fiscal year and would be spent on further expansion, including an increase in strength from 916,000 to 936,000, and in the number of wings from 131 to 137, accelerated production of the B-52 bomber and also of the F-101B escort fighter and the F-104 interceptor. Is rearmament thus to continue along conventional lines?

This view is again contradicted by a Washington correspondent's report in the "Frankfurter Allgemeine Zeitung" of August 4th which states that part of the testimony of General Twining, Chief of Staff, U.S. Air Force, before a Senate Subcommittee on June 19th had just been released. Twining supported the new strategic planning based almost entirely on atomic weapons. U.S. forces should be substantially cut so as to remain within reasonable financial limits. Concentration on new weapons, but with retention of some conventional armament to counter the threat of peripheral wars . . . It was just not possible to have everything . . .

And Twining is reported to have added that Britain shared this view.

That this would appear to be correct is revealed by a well-documented article by Norman H. Gibbs, Professor of History at Oxford University, in the American journal "Air Force"—normally concerned with purely American affairs. Under the title "Britain's Defence Budget," Gibbs makes the following points: though the British defence budget of £ 1,550,000,000 (or $ 4,330,000,000) cannot be compared with the ten times bigger American appropriations, it swallows up approximately one third of total British Government spending: nearly thirteen shillings a week per head for every Briton, man, woman and child! Chancellor of the Exchequer Norman MacMillan now regards this as an intolerable burden in Britain's financial situation. Now that large and small H-bombs are also available to the British forces, certain financial and defence circles have arrived at a New Look; what is the use, in the atomic age, of costly, complicated, rapidly out-dated weapons of conven-

No Cut-Price Security

The very next day after the beginning of the Suez Canal affair, Britain realized that the problem Colonel Nasser had set the Western world had two major impacts:

— work on the peaceful uses of atomic energy must be pursued with at least the same urgency and on the same scale as on its military applications;

— it is by no means certain that a defence policy based essentially on the threat of aero-nuclear reprisals is effective.

*

Only atomic power can in part replace oil. It is by no means sure that Europe can count for very much longer on the Middle East oil resoures. At the end of July it was the "maritime pipeline" that became threatened. Tomorrow the sources of oil themselves may be withdrawn from the Western companies. At present Europe consumes about 130,000,000 tons a year, 70% of which comes from the Middle East. In London it was estimated that holders of petroleum shares incurred a paper loss of £ 75,000,000 during the morning of July 30th alone. If Europe could continue to count on oil from the Arab states but had to carry it round the Cape, the cost of transport would be increased by 90%, and the extra expense could be balanced out only by using supertankers. Such ships could be built today, but would necessitate heavy port investments. Thus it is becoming increasingly clear that the most rational solution is to achieve independence in power supplies. The only way to do this, at least to a large extent, is by using nuclear energy. British industrialists note that one fifth of the power consumed in the United Kingdom is generated by oil, and they are beginning to demand an expansion of the country's ten-year atomic programme, so that a large proportion of this energy can be supplied in the reasonably near future by nuclear fission.

Will this new requirement allow Britain to continue her programme of atomic weapons? During the French National Assembly's debates on Euratom the question was repeatedly raised of whether the two programmes could be executed side by side or whether, in giving priority to one, the Government would be obliged to abandon the other. Does not the same problem arise on the other side of the Channel? Thus, the Suez Canal affair may have not only economic but military repercussions.

*

Indirectly affected by the new priority that will have to be given to all peaceful applications of atomic energy, the United Kingdom's recently announced defence policy may well have to be revised as a direct result of events in Egypt.

The White Paper published in London at the beginning of the year outlined the policy then in favour as follows:

"...The forces required to support our present strategy have, therefore (the following) roles to fulfil:

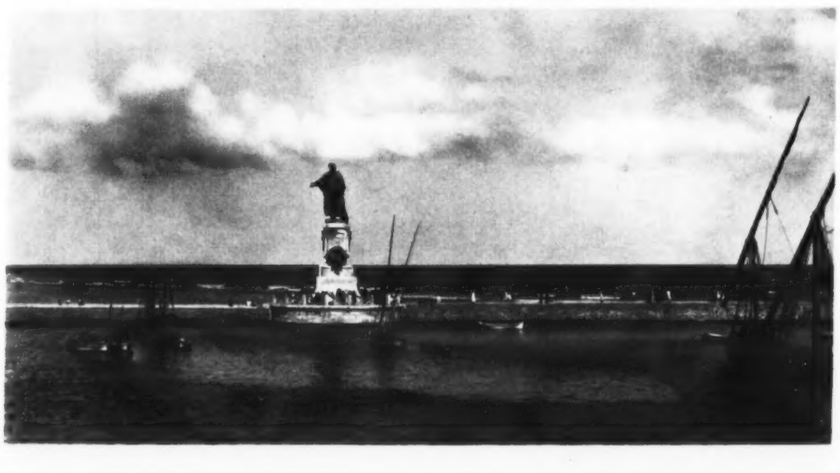
1. They must make a contribution to Allied deterrent commensurate with our standing as a world power. This means not only building up and maintaining a nuclear stockpile and the means of delivery but, also, contributing to the maintenance of N.A.T.O.'s defensive effort by land, sea and air.

2. They must play their part in the cold war. By their mere presence they can contribute to the stability of the free world and the security of overseas territories where peaceful development may be threatened by subversion whether overtly Communist or masquerading as nationalism.

3. They must be capable of dealing with outbreaks of limited war, should they occur..."

Hence, in their wisdom, the authors of this official text based British military policy on a mixed defensive instrument, capable on the one hand of discouraging aero-nuclear aggression and on the

At the entrance to the Suez Canal at Port Said stands a monument to Ferdinand de Lesseps, the French engineer who created the West's "maritime pipeline", the safety of which Britain fought in two wars to preserve.



tional design? Nobody will use them! The British nation can be safeguarded by 200 V-bombers, whose medium range and atomic load would enable them to act as either a deterrent or a reprisal force . . . tactical air forces would gradually become superfluous . . . During the past ten years British industry had worked out, at the cost of considerable effort and funds, a total of 160 different aircraft projects, of which 140 were scrapped and of the remaining 20 only 8 had really led anywhere . . . Let us cut down, as fast as possible and to a level commensurate with the safety of the nation and its commitments to its Allies, namely N.A.T.O.

Was General Twining thus correct in stating that British views matched his own? The New Look is to be found everywhere.

Where such a right-about turn might lead in an age where local conflicts are still possible is described on these pages under the heading "No Cut-Price Security." Unless, of course, a general disarmament programme were accepted and the Cold War ended.

This is the background against which this year's Farnborough Display will be staged. Many circles in Britain's industry are concerned at these developments; many of the "regulars" among this year's visitors doubt whether this time there will be much new to see in the way of aircraft — though engine and equipment developments are expected to be plentiful.

All is not yet lost, however, and the British aircraft industry, too, can look to the future hopefully. It may turn out that Egyptian President Colonel Nasser has done it a good turn with his *coup* against the crown jewel of Suez, which the British have successfully defended in two wars. Doubtless, though, this was not his intention.

Edinburgh Castle, chief landmark of the Scottish capital, where the I.A.T.A. Annual General Meeting is to be held.

Meanwhile, sales representatives of American and British aircraft manufacturers are busily packing their samples cases and preparing their offers to the illustrious guests and potential customers from world air transport circles who will throng the capital of Scotland for the I.A.T.A. Annual General Meeting on September 17th.

If the Government decides to hold back on military orders, the airlines may perhaps fill the gap. Were not companies such as Douglas able to point out in their last financial report that 46 percent of their backlog of nearly $ 2,500,000,000 was formed by orders for commercial transports? Is the situation not similar for Lockheed, Pratt & Whitney and even Rolls-Royce? And would Vickers-Armstrongs be in such a strong position if they did not hold a trump card in the *Viscount* series?

Such sales prospects are undoubtedly a certain comfort to manufacturers. In addition, the New Look will open up for them other possibilities, besides bombers and guided missiles, since bombers need flying tankers, and military operations need transports which have hitherto been somewhat neglected by the British Government.

Nothing is ever eaten as hot as it is cooked. Not every country is governed by a dictator, and neither Admiral Radford nor Norman MacMillan can simply issue decrees without asking Parliament. This is one of the advantages of the Western form of democracy which–why deny it?–cuts a somewhat sorry figure in these early days of August 1956. *EEH.*

other of thwarting any designs a potential enemy might have of venturing into localised conflicts. This meant that in addition to a substantial non-atomic force (to counter the threat of local wars), the United Kingdom would have an aero-nuclear force sufficiently powerful to discourage any impulse to launch an atomic attack on its sources of power or its existence as a free Power.

But the ink on the White Paper was scarely dry when economic considerations led the British Government to plan substantial reductions in manpower and conventional weapons, acting rather as if atomic weapons provided an insurance against all risks, economies could be made on the rest and security purchased at a reduced cost. Korea and Indo-China should have been a warning. Nuclear weapons have no effect on such warfare, since they cannot be used. And because they cannot be used they lose all political power, all deterrent effect.

The economists' equation

Economists and politicians would be only too pleased to discover an efficient weapon at lower cost. The development of the new highly destructive weapons has persuaded them that it would now be possible to reconcile the irreconcilable and to obtain better defences by spending much less money. Thus manpower cuts have been announced that will inevitably lead to a complete refashioning of the British defence system. The aircraft industry is already beginning to feel the effects of this decision. Several companies are talking of redundancies, and the Admirality of reducing staff and equipment.

In a publication whose chief aim was to minimize the military capacity of nuclear weapons, Professor P.M.S. Blackett, 1948 Nobel prizewinner, stated that a plutonium bomb is considered to cause as much destruction as 167 ten-ton block busters each containing 5 tons of TNT. Thus even a relatively small A-bomb, as compared with recent experiments, reduces by 167 the number of aircraft needed to inflict a given amount of damage on an enemy, in this case equal to the destruction at Nagasaki.

If this reasoning is carried to its logical conclusion, it would be possible to count on the fingers of one hand the number of aircraft, each carrying an H-bomb of 5 to 15 megatons (5 to 15 millions of tons of chemical explosive), needed to devastate a large country. To a great extent the argument is correct, provided the whole military system can be based on atomic weapons and provided the sole threat to the life of the nations is atomic. The R.A.F.'s new Bomber Command, organized around ten times fewer aircraft than Air Chief Marshal Harris had under him in 1944, would still be superior in destructive potential.

But if, ignoring the wise policy outlined by the last White Paper, the British defence effort were limited to the establishment of an aero-nuclear force (powerful despite its numerical weakness), the Government would face the following dilemma in the event of a crisis: either to threaten nuclear action, or to capitulate for lack of resources other than its atomic reprisal force. It is common knowledge that the enemy never attacks where he is expected to, but only where the terrain is most favourable to him. The threat of aero-nuclear reprisals could scarcely be applied unless the very life of the British people were openly threatened. Between the Commonwealth's present situation and this extremity there is room for years of "nibbling" which would have to be faced with a non-atomic military instrument; i.e., by mobilizing larger forces of men and material.

P.S.: Since the above article was written, an eminent Soviet military spokesman has indicated that he is in general agreement with its arguments. On August 7th the "New York Times" published a letter which Marshal Georgi Zhukov, the Russian Defence Minister, had sent to "Times" Military Correspondent Hanson W. Baldwin in reply to a questionnaire, setting forth his opinion that "future wars would require large armies and tremendous quantities of ordinary arms, despite the development of air power and nuclear weapons ... The new combination of air power and nuclear weapons by itself cannot decide the outcome of an armed struggle..."

Aviation Days in Britain

Farnborough and I.A.T.A.

BY THE RT. HON. REGINALD MAUDLING, M. P.,
Minister of Supply

I am particularly glad to have this opportunity of contributing to this special edition of *Interavia* dealing with the Society of British Aircraft Constructors' Farnborough Display in 1956.

For Britain this is a year of adjustment when we are seeking to harness the full strength of our manpower and research facilities to those projects, both civil and military, which will yield the greatest national dividend for the future.

In civil aviation, 1956 will see the entry into service of the Bristol *Britannia*. We confidently expect that this fine aircraft will set a new standard of comfort and efficiency in air travel and will have a great future. The Vickers *Viscount* has continued its outstandingly successful career, and well over 300 are on order or have been delivered. The later series *Viscounts* now being ordered show that the potentialities of the original design are far from being exhausted, and a new Rolls-Royce/Vickers project, the *Vanguard,* has also been ordered by British European Airways. The first de Havilland *Comet 2s* on order for the R.A.F. have been delivered, and most notably the *Comet 4* is already on order for British and American operators.

British aircraft engines have earned a special place in world aviation. Six foreign civil aircraft types are already using British designed engines, and there are strong indications of a growing demand in this field. At the present moment British developments in the propeller-turbine class have been attracting much attention: this versatile form of power plant, in which the British industry has specialized, has proved particularly suitable for the current needs of world operators. The Rolls-Royce *Dart,* which by the middle of this year had flown over a million hours in *Viscounts,* is the only propeller turbine engine in the world so far in scheduled service.

On the military side we now have in R.A.F. service the *Valiant* and *Vulcan* bombers, to be followed shortly by the Handley Page *Victor,* developed marks of the *Canberra,* the Gloster *Javelin* all weather fighter and the latest marks of the Hawker *Hunter* which is also in service with N.A.T.O. air forces. On the naval side, in addition to the current types, progress with the new generation of fighters, the Supermarine N. 113 and the DH. 110, has been rapid and encouraging. In addition, British helicopters of various types are being widely used in varying civil and military roles.

In short, while the re-equipment of the Royal Air Force and the Royal Naval Air Arm is proceeding rapidly, with appropriate readjustments in the light of new weapons and new requirements, the contribution of the British aircraft industry to world aviation and the nation's exports increases apace.

The exports of aircraft and aircraft engines, military and civil, during the first half of 1956 have already reached record levels, amounting to £55 millions. It is natural therefore that the annual Display at Farnborough is attracting each year an ever-increasing number of visitors who are very welcome and to whom I wish a successful and enjoyable time.

BY THE RT. HON. HAROLD WATKINSON, M. P.,
Minister of Transport and Civil Aviation

I am grateful to the Editors of *Interavia* for the opportunity they have given me to welcome the representatives of the foreign and Commonwealth air companies who will be our guests in Britain this month at the annual display of the Society of British Aircraft Constructors, at Farnborough, or at the Annual Conference of the International Air Transport Association which takes place this year in Edinburgh, with Lord Douglas of Kirtleside, the Chairman of British European Airways, as President.

The S.B.A.C. show is always a brilliant affair for the layman as well as the expert, with its thrilling display of flying and its review of recent technical achievement in all fields of aeronautics. But it is, of course, more than that, for it is also a great trade fair, where the Society's customers from overseas can inspect in close detail the new British aircraft that will be coming into commercial service in the future and some of the well-established types that have already contributed splendidly to our export trade and won prestige for British airlines. It is just ten years since the first post-war S.B.A.C. show was held, and although there have been set-backs during those years, the industry has, as the whole world recognises, some notable achievements to its credit. As the Minister responsible for air transport, I am particularly pleased with the success of the *Viscount,* about 350 of which have now been ordered by some 34 airlines at home and overseas. The industry has increased the total annual value of British aircraft exports from £14.5 millions in 1946 to over £66 millions last year. This year results promise to be even better.

In this country, as in others, aircraft manufacturers are constantly striving to meet the airlines' requirements for bigger aircraft that can fly faster, further and more economically, so that air travel can be brought within the reach of an ever-widening market. The airlines have, since the end of the war, already increased six-fold the number of passenger-miles flown on all the international routes, and the rapid development of international air transport has inevitably given rise to many new and complex problems, both technical and financial, which could only be solved satisfactorily by international agreement. It is one of the great achievements of the International Air Transport Association that it has provided the means for more than seventy airlines of many nations to sort out their problems and so to clear the way for more vigorous, yet orderly, development. The representatives of the airlines of many nations who meet together at I.A.T.A. conferences all have their own ambitions and interests, and it is a great credit to them and to their Association that, on so many difficult problems, they are able to reach agreement which is acceptable to all the airlines and to their Governments. I wish the Association every success in its deliberations this year.

Military Aviation - U.K.

BY INTERAVIA'S LONDON EDITOR D.W.

London, mid-July 1956. Britain has now squarely faced the fact that in the atomic and hydrogen bomb era there are only two nations—the U.S.A. and Soviet Russia—who can safely afford nuclear defence and offense plus a full armoury for waging a conventional war.

This realization has led to the greatest upheaval ever in British defence planning and purchasing, and its effects are already being felt in the three armed services as well as in industry.

Briefly, the new Government plan is to scrap as many conventional weapons as possible, speed up a changeover to guided weapons and automatic processes, and drastically cut the number of new projects—particularly aircraft.

All this has come as the result of four things: 1. a final analysis of the effects of the hydrogen bomb: 2. a lessening of world tension: 3. a determined budget squeeze to stop inflation, and 4. probably most important of all, *the United Kingdom now has 'A' bombs and tactical 'A' bombs in squadron use and is stockpiling the weapons.*

For the R.A.F. this means a big re-appraisal of its long-term policies and general contraction over the next ten years—unless the international situation gets worse. The R.A.F. is to be the Number One "Hot-War" service with the primary role of "hydrogen bomb deterrent".

The Royal Air Force

The "V" bomber force will be Britain's weapon against aggression for many years, right, in fact, until the British I.C.B.M. is in full service—which will be in ten years at the earliest. Even then a supersonic long range bomber will be kept in service as a guarantee against trouble with the I.C.B.M.

The *Valiant* is now in full scale service, and production is being phased out, while simultaneously the *Vulcan* and the *Victor* are flowing off the lines, with the former to be in squadron use before the end of the year.

In squadron service with R.A.F. Bomber Command: four-jet Vickers *Valiant* strategic bomber.

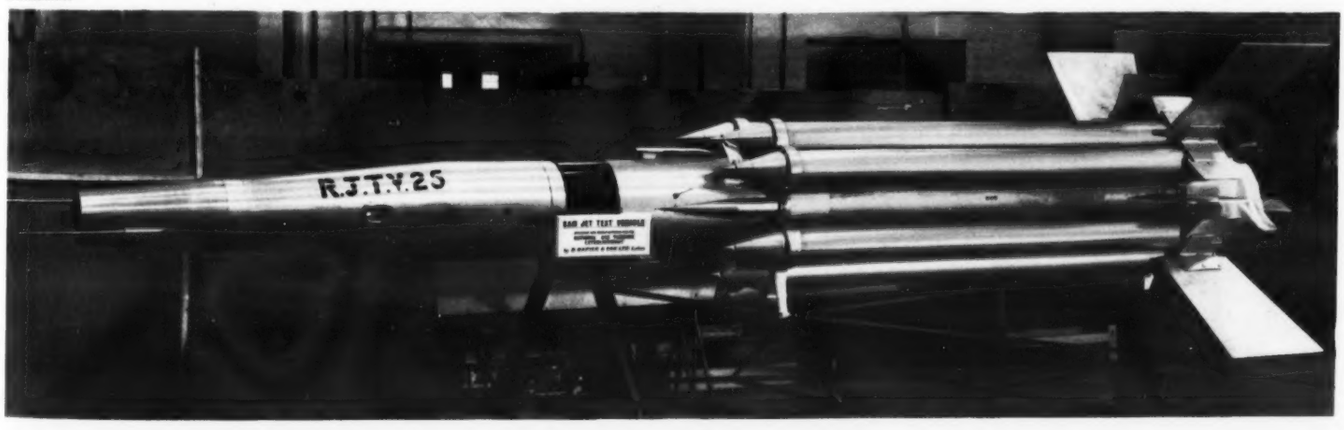
Both *Vulcan* and *Victor* will be progressively improved in the years to come, particularly by the addition of the latest radar, weapons and weapons/radar countermeasure devices. The power of the *Olympus* will steadily rise, giving improved performance, while it is understood that the *Victor* in later forms will make use of the powerful Rolls-Royce *Conway* in place of its present *Sapphires*.

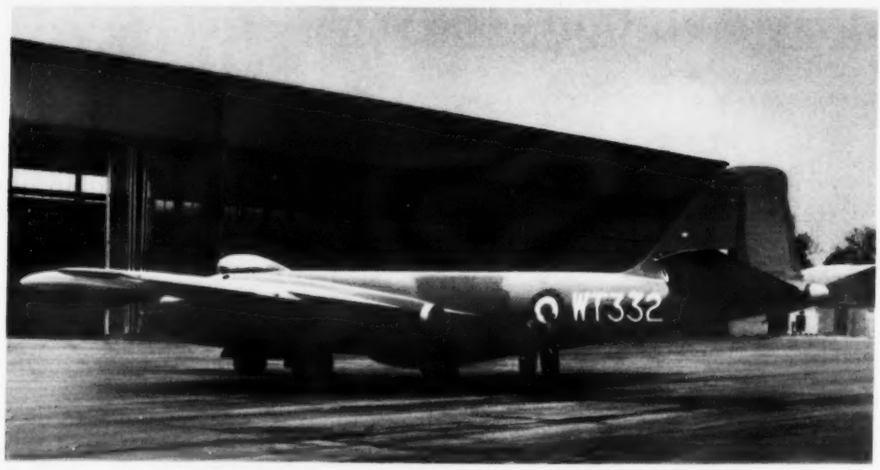
The *Canberra* seems to possess the elixir of youth, as it is likely to remain in first-line service for many years. The *Canberra B. 8* with its joint close-support/high altitude bombing capability will become the mainstay of Britain's tactical "A" bomber force, particularly in the 2nd Tactical Air Force in Germany.

*

Fighter Command has reached the peak of its post-war re-equipment with the full-scale arrival of the *Hunter* and the *Javelin*. It will decrease in size as guided weapons come in. Contrary to many forecasts, it will be a long time before piloted interceptors are entirely replaced by ground-fired guided weapons in the R.A.F. A battle has been raging for years between the protagonists of the guided weapon and the more conservative elements in the Ministry of Supply and the R.A.F. The former said as long ago as 1951 that there would never be another generation of fighters in service after the *Hunter*!

Guided missiles . . . still in the experimental stage: the RJTV-25 Ram Jet Test Vehicle, with eight launching rockets, built by D. Napier & Son for the National Gas Turbine Establishment.





The twin-jet English Electric *Canberra B.8* forms the backbone of the R.A.F.'s 2nd Tactical Air Force. It is equally suitable for ground support operations or for bombing from level flight.

The Handley Page *Victor* four-jet strategic bomber is to be progressively developed during the coming years.

Unfortunately, while great progress has been made with missiles, they are still nowhere near reliable enough. There are now likely to be two further generations of British fighters, but with only one or two projects in each case and in very much smaller numbers than hitherto. The first new generation will, of course, largely consist of the English Electric P. 1, which will be developed over a period of years for a number of roles. The rocket-plus-jet combination is likely to become a standard design formula for long and short range types. The P.1 lends itself to such an installation, and an evaluation of the system's merits will be made with the Saunders Roe SR. 53, the prototype of which is nearing completion and which is said to have a *Spectre* rocket plus a *Gyron Junior* turbojet.

A number of interim interceptors were "axed" in the development or prototype stages, including a *Hunter* with greater wing sweep, a Vickers project developed from the *Swift,* and more recently the "thin wing" *Olympus*-powered *Javelin.*

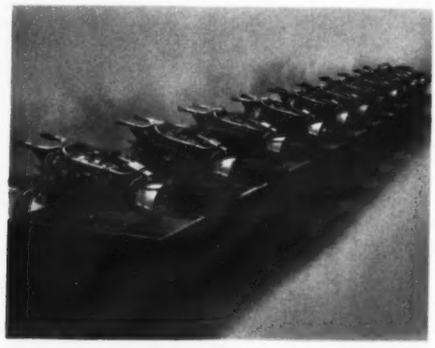
The airborne guided weapon will be on large scale test with Fighter Command in 1957 in the shape of the Fairey *Fireflash,* and this will be followed by the much reported de Havilland infra-red heat homing weapon.

During the next two years, the R.A.F. will also get its first operational experience with ground fired guided weapons (rumoured to be of English Electric design). The full-scale nation-wide rocket set-up with automatic radar sighting, computing and firing—which, it is ultimately envisaged, will form Britain's main defence line—will, however, take a very long time to set up and perfect, although much of the actual radar side has already been completed.

*

Transport Command, which has long been in dire need of new equipment, is to benefit from

Napier rocket engine for guided missiles (evidently anti-aircraft rockets).



Gloster *Javelin* all-weather fighter of R.A.F. Fighter Command takes off from Gloster Aircraft Co.'s Moreton Valence Airfield.

orders placed this year for batches of *Comet 2s* and *Britannias*. The *Comet 2s* are already arriving in service and there seems to be a possibility of the R.A.F. later having some *Comet 4s*. Despite all this, there will still be a shortage of aircraft in Transport Command and without some expansion it will not be able to meet its growing commitments.

Two other R.A.F. Commands, Coastal and Flying Training, are on the brink of new things. Coastal Command's job, with the rising menace of the nuclear missile-equipped submarine, is getting daily more important, and replacements will be needed for the piston-engined Avro *Shackleton* and Lockheed *Neptune*. Flying Training Command, meanwhile, are trying to formulate their new requirements for basic and advanced trainers.

Much experience has been gained with the *Jet Provost* at Hullavington and on this basis the R.A.F. has been preparing a new jet trainer specification. Whether it will order a basic trainer of the *Jet Provost* or Miles *Student* type or concentrate on a multi-purpose swept-wing two-seat jet is not yet known—the outcome of the past 12 months trainer research by the Service will, however, be of considerable interest to the air forces of other nations.

The Fleet Air Arm

In the Naval estimates for 1956–57, the First Lord of the Admiralty said that "the concept of the battle-group, centred round the modern carrier with its multi-purpose squadrons of aircraft, is nearing realization".

Unfortunately, it is nearer realization in the mind of the First Lord than it is in terms of actual ships and aircraft. Ever since the war the Admiralty has underestimated the role of the Fleet Air Arm and has starved it of support both mentally and physically.

It has only been during the past 12 months that the realization has penetrated into the gloomy recesses of Whitehall that without air potential the modern Navy can do very little. The Fleet Air Arm possesses first-class air crews and some extremely fine tactical and engineering brains, but most of them are suffering from an overdose of poor promotion and general frustration.

Efforts are now being made to give the Fleet Air Arm up-to-date equipment, but it will be some time before results are apparent. At present, and at least until next year, the Navy has only two squadrons of true strike aircraft, and no swept wing fighters. Over the years, the industry has offered many promising designs, but through Naval "wait and see" policy squadrons have had to be content with little and late. Weight is now a major problem, as the big twin jet machines are essentially for operation from Fleet Carriers and not from smaller ships.

The bright spot in the equipment programme has been the Fairey *Gannet* for search/strike, which is now in large scale use, and of which an airborne early warning version is under development. The *Seahawk* has been doing yeoman work as an interceptor/bomb and rocket strike machine, but a replacement is needed.

For future strike and all-weather fighting a batch of DH. 110 twin-*Avon* aircraft has been ordered, and for tactical "A" bomb carrying the Vickers N. 113D is on order, also with two *Avons*. Both types should appear in service before the end of 1957.

Continued accent on the strike category is shown by the Navy announcement of a new strike design (presumably supersonic) which is reported to be under development by Blackburn and General Aircraft.

A good deal of experience has been gained by the Fleet Air Arm with helicopters, and as a result it has ordered the *Wessex*, a development of the S-58 with two *Gazelle* turboprops.

Prototype of the future Vickers N.113 carrier-based naval aircraft, which reaches supersonic speeds in level flight.

Fairey *Gannet* three-seat anti-submarine aircraft.

Farnborough

The Future of British Long-Range Air Services

by Basil Smallpeice, Managing Director,
British Overseas Airways Corporation, London

Now that B.O.A.C. is emerging from the difficulties which inevitably followed the withdrawal of the *Comet I's* from service, it has prepared its plans to meet the challenging times ahead.

Undeniably, the past two years have been a testing period for the Corporation. Swift redeployment of our aircraft fleets and other operational and commercial measures, however, did much to counteract the heavy penalty we paid as pioneers of pure jet transport, and the fact that we were able to maintain our competitive position was a mark of the Corporation's resilience.

Now we are aiming to move forward again. One of the vital factors in this new air age is the long range turbine-powered airliner. B.O.A.C. still retains the lead it gained in the operation of such aircraft—a lead that will be further demonstrated with the introduction into service of the world's first long range propeller turbine type, the Bristol *Britannia 102,* an airliner with a promise of fast, smooth and comfortable flight and one that promises to be a good economic proposition from the operator's point of view. Its inauguration on the routes to South Africa, Australia and the Far East will be welcomed, I am sure, by the passengers who will fly in it.

Meanwhile, during the coming winter the Corporation will begin to operate another new aircraft—the Douglas DC-7C. The first of the ten on order for B.O.A.C. is due for delivery from Santa Monica in October. Early next year that other fine American West Coast product, the Boeing *Stratocruiser,* should be handing over the Corporation's first class London/New York services to the DC-7C. However, the excellent passenger facilities of the *Stratocruiser* will continue to be available on the Corporation's Canadian flights across the North Atlantic throughout 1957.

It is with the DC-7C that B.O.A.C. hopes to achieve by about April of next year one of its long-standing ambitions for route expansion—the extension of our North Atlantic routes across the United States to San Francisco. It is intended that the DC-7C shall fly a fast service to San Francisco with only one stop, at New York.

Thus B.O.A.C., in conjunction with the Australian carrier, Qantas Empire Airways, which operates a Sydney-San Francisco service, will create a new Commonwealth round-the-world route, for already the two airlines fly in partnership between London and Sydney, and from there the services of Qantas span the Pacific.

The advent of the Long Range *Britannias,* the series 312, will bring more changes in B.O.A.C.'s North Atlantic operations next year. In the latter part of that year these aircraft should begin to take over some of the services operated by DC-7C's, which the *Britannias* are also likely to replace on the New York-San Francisco route during the winter of 1957-1958. The *Britannia,* therefore, will bring to North America the first opportunity for long range turboprop travel, as the Vickers *Viscount* has done in the field of shorter range flights. Continued page 679

Traffic at London Airport evidences the close cooperation between B.O.A.C. and the airlines of Commonwealth countries: B.O.A.C. headquarters with Lockheed *Super Constellations* belonging to B.O.A.C. and Australia's Qantas Empire Airways.

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CF-100's will start augmenting RCAF NATO squadrons in Europe this year to help meet that Continent's night-fighter, all-weather defense requirements.

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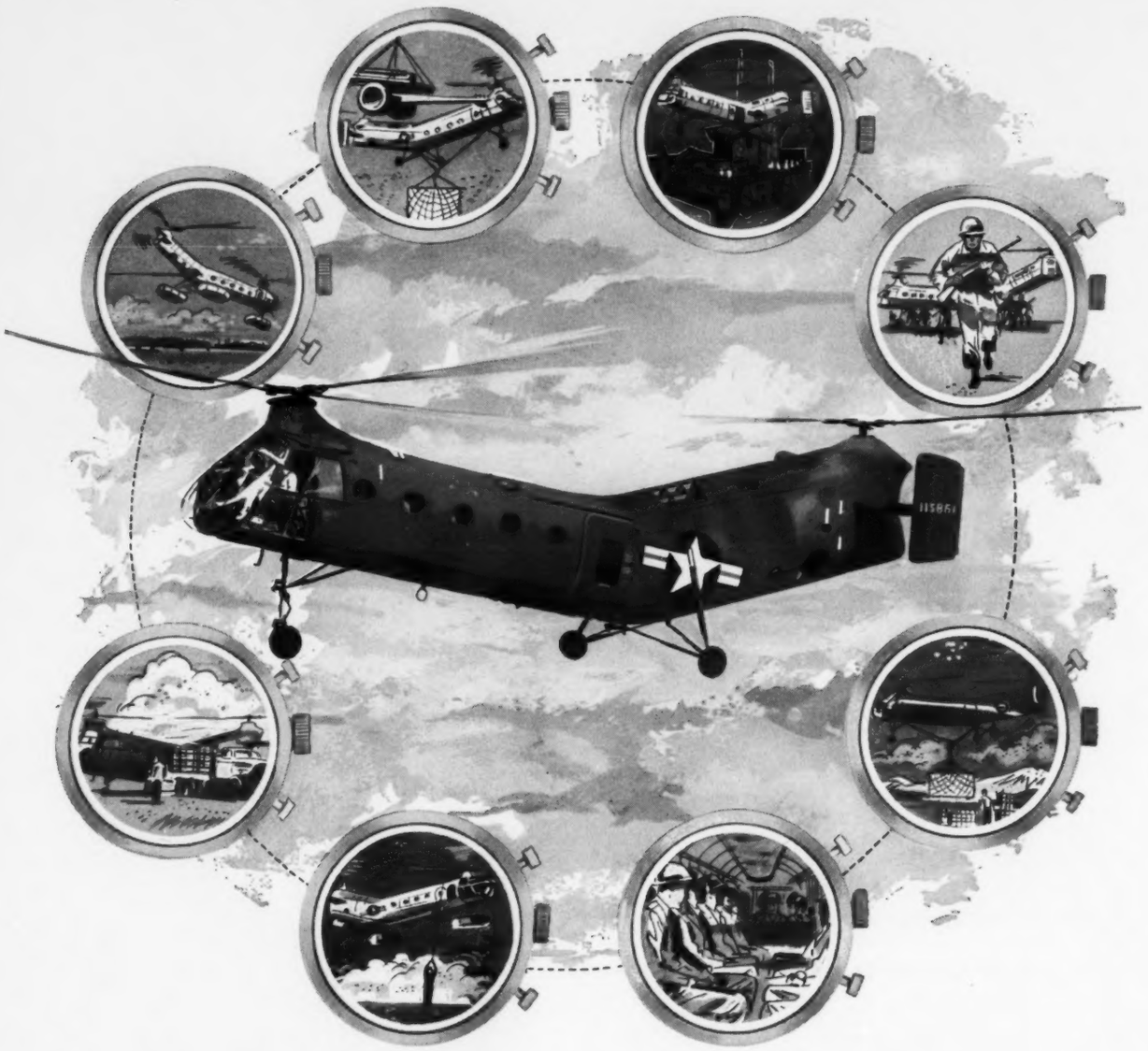

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Light tactical support aircraft
for N.A.T.O.

B.O.A.C. has ordered 19 de Havilland *Comet IV* jet transports, to be placed in service on the Commonwealth routes in 1959-60. The *Comet III* prototype.

Furthermore, the DC-7C and the *Britannia 312* should enable us to offer, for the first time, regular non-stop flights in both directions between Britain and North America.

The certainty that such flights will become commonplace and the new Atlantic fare structure which begins this autumn will together produce a considerable revolution in the character—and, I hope, the volume—of trans-Atlantic flying in the next few years. The new excursion fare, next year's introduction of lower first class fares and new de-luxe flights, and the proposed new tourist-type service, planned for the spring of 1958, will be major factors in the significant changes taking place on the important dollar-earning routes.

Already a new concept of travel between Europe and North America has resulted from the pioneering work of Scandinavian Airlines System and Canadian Pacific Air Lines on the Arctic region routes. B.O.A.C. has watched these developments with great interest but so far has been precluded from participation in them by lack of suitable aircraft. Now the prospect of a radical improvement in our equipment position has carried our consideration of the polar route to a more active stage, and we hope to utilize the impressive range characteristics of the *Britannia 312* on such a route from Britain to the West Coast of America in 1958.

I trust also that in the next few years there will be a broadening of our airline association with our partners in the Commonwealth and other parts of the world.

In Africa, for instance, B.O.A.C.'s partnership agreements are being extended to include East African Airways Corporation, which is to buy three of our Canadair *Argonaut* aircraft in order to begin its first trunk route operation—between Nairobi and London—in association with B.O.A.C. during next year. Along the route to South Africa B.O.A.C. has been in partnership with South African Airways for many years—and now also with that airline and Central African Airways, on a new C.A.A. *Viscount* tourist service between Johannesburg and London.

In the Middle East, B.O.A.C.'s association with local interests, British European Airways and Hunting-Clan, a British independent operator, in assisting the development of a number of Arab national airlines, is showing encouraging results. The extent to which these associate companies in that part of the world are now going ahead is illustrated by the recent opening of a service from Beirut to London by Middle East Airlines and by that airline's plans for expansion to the Persian Gulf. Much of the success in this area is attributable to the operation of the Vickers *Viscount,* and a further four of these aircraft are on order for the use of these associates.

The turboprop *Viscounts* and *Britannias,* indeed, represent a substantial proportion of B.O.A.C.'s £ 85,000,000 stake in the British aircraft industry. That sum is the extent of our orders for British aircraft, engines and spares, including the pure jet *Comet IV,* of which we have ordered 19 for introduction into service on Commonwealth routes in 1959-1960. The need for broad and courageous thinking, yet flexible enough to meet any change in world situation, is manifest.

Centre: Even when the Douglas DC-7C are introduced on B.O.A.C.'s Atlantic services early in 1957, the Boeing *Stratocruisers* will continue to be used on the Canada route.

Bottom: Thanks to its speed and comfort, the Bristol *Britannia* propeller turbine aircraft promises to be a money-maker for B.O.A.C. A *Britannia* at Nairobi (5,371 ft. above sea level).

The British Aircraft Industry Changes Course

... and trends...

Report by E. B. on his visit to England

A shadow has fallen over the Farnborough Display this year. The Chancellor of the Exchequer has announced drastic cuts in the defence budget, and there can be no doubt that this measure will have serious repercussions on the United Kingdom's aircraft industry. Though the first results of this economy policy will not be felt for several months, the production programmes of most airframe, engine and equipment manufacturers already reveal an unmistakable change in direction. Britain's aircraft industry is making unprecedented efforts to secure a leading position in the international market for civil aircraft. The change-over will doubtless mean headaches for all the firms involved, though most of the large companies should be able to master the situation without excessive difficulties. For some smaller enterprises, however, cuts and cancelled orders may well be equivalent to a threat to their very existence.

What then, will be the characteristic features of the Farnborough Display under these conditions? It may be assumed that, as last year, the main emphasis will be placed on engines and the products of the accessories and equipment industries. Military production will be represented by a few new versions of already known aircraft and, above all, by new guided missile developments. Needless to say, practically all leading firms have guided missiles divisions whose importance is constantly growing.

*

Turbojet or turboprop for the civilian market?

When the large-scale orders for American long-range jet transports were placed in the latter half of 1955, the question of whether propeller turbines or pure jets should be given preference for future commercial airliners once more became acute—and not only in Britain.

George Edwards, Managing Director of Vickers-Armstrongs Ltd.'s Aircraft Division, with whom we recently discussed this question, stated that he had not changed his opinion that long-range transport—in particular across the North Atlantic—belongs to the pure jet aircraft while the turboprop airliner will remain king of the medium-length route. However, he added, it must not be forgotten that the American domestic and European markets have different requirements, a fact that will have its repercussions on aircraft procurement in the two regions.

Viscount: a bestseller: With the sale so far of 327 *Viscount* turboprop transports—a substantial proportion of which has been ordered by U.S. airlines—Vickers-Armstrongs has obtained a strong position which seems unlikely to be threatened for the time being. The firm hopes to continue *Viscount* production for at least another ten years, the ultimate goal being the development of a larger version to be powered by four later-model Rolls-Royce *Dart* engines of approx. 3,000 h.p. each.

Despite its success with the *Viscount* and, more recently, its orders for the considerably larger *Vanguard,* Vickers-Armstrongs is by no

Twenty Vickers *Vanguard 951s* with Rolls-Royce *Tyne* turboprops were recently ordered by British European Airways.

means neglecting the possibility of producing a medium-stage airliner to be powered by pure jets. There are no fewer than 25 projects for jet transports in the design office files, and studies are now being made for a long-range supersonic model . . . not only at Vickers, but reportedly also at Bristol and A.V. Roe.

Britannia for long and medium stages: The contest between turboprop and pure jet engines for commercial transports is also being followed with increased attention by *Bristol Aircraft Ltd.* Peter Masefield, Managing Director of Bristol Aircraft, expects the situation to clarify within the next nine to twelve months and anticipates large orders for both categories, in particular from airlines operating medium-stage routes. In Masefield's view, the introduction of cheap third class services (roughly 20% below the present tourist rates) will lead to a parting of the ways. Pure jet aircraft will be used primarily for first-class long-distance services, possibly complemented by turboprop designs on the cheaper services; turboprops will be preponderant on short and medium stages, though both categories may again appear on the longer medium stages. For ultra-long distances (such as London-San Francisco) he felt, however, that only turboprop transports would be of immediate interest, since the size and weight of a pure jet model for this purpose would be prohibitive.

At any rate Bristol Aircraft has succeeded in getting a foothold on the international airliner market, though for the moment on a more modest level than Vickers. Orders for the *Britannia* (four Bristol *Proteus* turboprop engines) have been placed by El Al Israel Airlines and Canadian Pacific Airlines. With the orders from B.O.A.C. and the Ministry of Supply, backlog now stands at 55 aircraft.

The first *Britannias* are to go into service on B.O.A.C.'s network this autumn. Further sales prospects for this type—and hence for all turboprop aircraft in its class—depend on its operational behaviour with B.O.A.C. Should the *Britannia* be anything like as successful on long stages as the Viscount has been on medium routes, then there should be no shortage of orders. Meanwhile, further versions are planned: a Series 400 with longer fuselage and accommodation for 130 passengers, a structurally reinforced version with BE.25 *Orion* engines for cruising speeds around 460 m.p.h., and finally a medium-haul version which could be marketed about 1958.

Comet 4 and 4A in the news again: Along with Vickers-Armstrongs and Bristol, mention should be made of *de Havilland,* which is so far the only British manufacturer to have produced a jet airliner, the *Comet.* Now that the well-known teething troubles seem to have been finally

British commercial transports on order

Deliveries up to about 1960
(number of aircraft already delivered in brackets)

Long and medium-stage types:

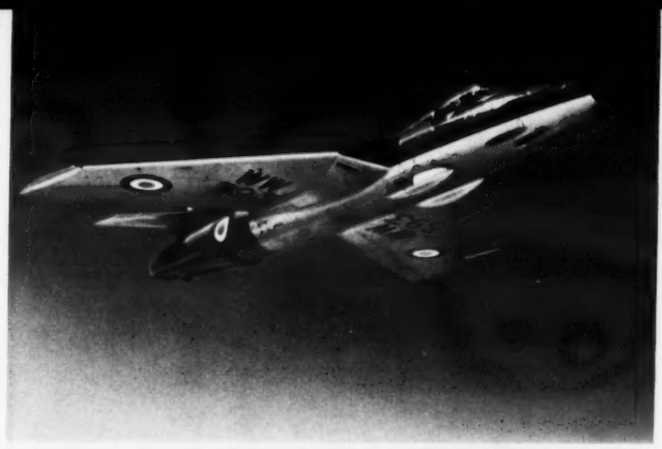
Airline	Aircraft type	No. ordered
BOAC	Bristol Britannia	(6)+27
Canadian Pacific Airlines	Bristol Britannia	5
El Al Israel Airlines	Bristol Britannia	3
BOAC	de Havilland Comet 4	19
Capital Airlines	de Havilland Comet 4 and 4A	14

Short and medium-stage types:

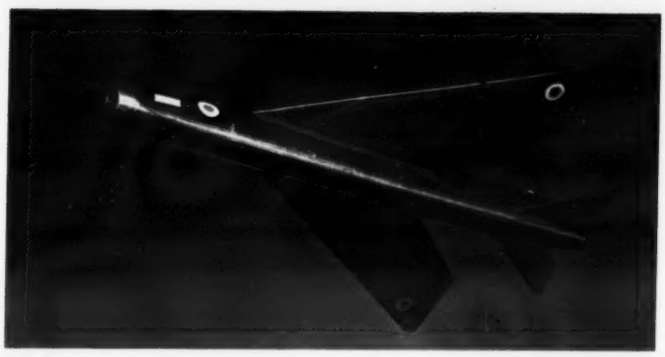
Air Kruise (U.K.)	Handley Page Herald	6
Australian National	Handley Page Herald	20
Queensland Airlines	Handley Page Herald	3
Lloyd Aereo Colombiano	Handley Page Herald	6
Aer Lingus	Vickers Viscount 707	(4)
	Vickers Viscount 808	3
Air Austria	Vickers Viscount 803	4
Air France	Vickers Viscount 708	(12)
Braathens SAFE	Vickers Viscount 742	1
BEA	Vickers Viscount 701	(26)+1
	Vickers Viscount 802	26
	Vickers Viscount 806	28
	Vickers Viscount 810-Series	7 (Option)
	Vickers Viscount 840-Series	12 (Option)
BOAC	Vickers Viscount 754	8
	Vickers Viscount 772	4
British West Indian Airways	Vickers Viscount 702	(4)
Butler Air Transport	Vickers Viscount 747	(1)+1
Capital Airlines	Vickers Viscount 744/745	(20)+55
Central African Airways	Vickers Viscount 748	5
Compania Cubana de Aviacion	Vickers Viscount 755	(3)
	Vickers Viscount 810-Series	4
Continental Air Lines	Vickers Viscount 812	15
Deutsche Lufthansa	Vickers Viscount 814	7
Fred Olsen Airtransport	Vickers Viscount 736	(2)
	Vickers Viscount 779	3
Hong Kong Airways	Vickers Viscount 760	2
Hunting Clan Air Transport	Vickers Viscount 732	(3)
	Vickers Viscount 759	2
Indian Airlines Corp.	Vickers Viscount 768	5
Iraqi Airways	Vickers Viscount 735	(3)
	Vickers Viscount 773	1
KLM Royal Dutch Airlines	Vickers Viscount 803	9
Linea Aeropostal Venezolana	Vickers Viscount 749	(3)
Linee Aeree Italiane	Vickers Viscount 785	6
Misrair	Vickers Viscount 739	(3)
New Zealand National Airways	Vickers Viscount 807	3
Pakistan International Airways	Vickers Viscount 815	3
Philippine Air Lines	Vickers Viscount 784	2
South African Airways	Vickers Viscount 813	7
Transair (U.K.)	Vickers Viscount 804	2
Trans-Australia Airlines	Vickers Viscount 720	(6)+1
	Vickers Viscount 756	5
	Vickers Viscount 816	2 (Option)
Trans-Canada Air Lines	Vickers Viscount 724	(15)
	Vickers Viscount 757	21
Union of Burma Airways	Vickers Viscount 761	3
BEA	Vickers Vanguard 951	20

Also 10 *Britannias* for R.A.F. Transport Command and another four for the Ministry of Supply. — Another 13 *Viscounts* in various versions have been ordered by Government departments or private firms. Total orders for *Viscounts* up to the end of July, 327 aircraft.

Production of the Vickers *Viscount* with four Rolls-Royce *Dart* propeller turbines. Up to date, 327 aircraft of this type have been ordered.



Backbone of Britain's air strength: (top to bottom) Hawker *Hunter 6* and English Electric P.1 fighters, and the three V-bombers, Handley Page *Victor*, Vickers *Valiant* and Avro *Vulcan*. The *Valiant* is already in squadron service and is now being phased out, but the *Vulcan* and *Victor* are still in full production.



Farnborough

Pure jet or turboprop? Despite sales success with the *Viscount*, Vickers-Armstrongs is also keeping an eye on the possibilities of a pure jet medium-haul transport. No fewer than 25 projects for pure jet aircraft have been prepared under George R. Edwards, Managing Director of Vickers-Armstrongs (Aircraft) Ltd. (left).—In the opinion of Peter Masefield, Managing Director of Bristol Aircraft (right), pure jet aircraft will probably be used chiefly for first-class long-distance services, and turboprop transports for short and medium stages as well as for tourist and the planned third-class services. For extra long stages only the turboprop aircraft will be of interest for the time being, he considers.

overcome, the firm is preparing to build the *Comet 4* long-range version ordered by B.O.A.C. Meanwhile the first foreign operator, Capital Airlines, has placed a contract for 14 of these aircraft, only four of which, however, are to be the *Comet 4* version. The remaining ten will be the *Comet 4A*—with 40-inch larger fuselage and wing span reduced by 7 ft.—which is more suitable for medium stage operation. Delivery date for the *Comet 4* is given as the end of 1958, for the *Comet 4A* the second half of 1959.

De Havilland's hopes that the Capital order will lead to others may well prove founded. At any rate the firm is continuing design work on additional versions of the *Comet*. In particular, developments with Bristol *Olympus* or Rolls-Royce *Conway* engines are being considered. These models will have improved cruising speed and range, compared with the *Avon RA.29* – powered Marks 4 and 4A and will be designed primarily for medium and short stages.

The feeder airliner market: Aiming at more modest goals than their bigger colleagues, a number of equally well known manufacturers are offering feeder aircraft to meet modern requirements. In addition to the Bristol and Westland commercial helicopters that will become available in the near future, mention should here be made of the piston-engined *Handley Page Herald* and *Scottish Aviation Twin Pioneer*. An interesting design has also been produced by *Aviation Traders* in their *Accountant*, which is powered by two Rolls-Royce *Darts*.

Handley Page is tooling up for production of a batch of 100 *Heralds*. Orders for more than 30 have been in hand for some time. With the *Accountant*, Aviation Traders are following a new line in that the version I of this aircraft will be marketed without internal fittings, while the slightly larger version II will be equipped as short-range passenger and cargo aircraft. The version I is designed as a touring and executive aircraft and can be equipped for the most varied purposes to suit customers' requirements.

Military aircraft take second place

The budget cuts referred to earlier will affect development and production plans for military aircraft, but should not influence appropriations for guided weapons. At least six large enterprises in the British aircraft industry have recently undertaken substantial expansion of their guided missile divisions. Several of the latest combat aircraft are now

(Continued on page 685)

An A.B.C. of the British Accessories and Equipment Industry

A

Aeroplastics Ltd., London:
Aircraft parts in plastics; extra-large radomes.

Aero Research Ltd., Cambridge:
"Redux" adhesives for load-bearing metal structures; honeycomb parts; high-temperature resistant adhesives.

Air Trainers Ltd., Aylesbury:
Electro-mechanical and electronic synthetic flight trainers; electronic simulators and analogue computers.

B

Boulton Paul Aircraft Ltd., Wolverhampton:
Power control units; electronic instruments for research.

British Communications Corp. Ltd., Wembley:
Multi-channel tape recorder for Air Traffic Control and similar applications; VHF communications equipment and electric measuring apparatus.

British Messier Ltd., Gloucester:
Landing gear for fixed-wing aircraft and helicopters; power assisted flying controls; hydraulic and electro-hydraulic servos; pumps; motors; other hydraulic accessories for aircraft systems.

British Oxygen Gases Ltd., London:
Liquid oxygen producing, storage and handling equipment for airfields; liquid oxygen converter systems for aircraft and oxygen demand regulators.

British Petroleum Co. Ltd., London:
Petroleum products for aviation, distributed in U.K. by Shell Mex and B.P. Ltd.

British Thomson-Houston Co. Ltd., Coventry:
Electrical aircraft equipment; turbo-starters; high-energy ignition units; AC and DC motors and generators; rectifiers; magnetos; electronic engine test units.

David Brown Industries Ltd., Huddersfield:
High tensile steel castings; heat resisting centrifugal castings for gas turbines; precision castings, etc.

S.G. Brown Ltd., Watford:
Aircraft gunnery control equipment; headphones and microphones; miniature motors; torpedo gyros; bomb carriers and release mechanisms.

Burndept Ltd., Erith:
UHF airborne transmitter-receivers; "Talbe" air-sea rescue equipment; dry batteries, including units for guided weapons.

C

E.K. Cole Ltd. (Ekco Electronics), Southend-on-Sea:
VHF equipment for ground-to-air communications; electronic equipment for guided weapons; airborne search radar units for storm-warning etc.; radar approach aids for secondary airfields.

A.C. Cossor Ltd., London:
Airport surveillance radar with Moving Target Indicator; secondary radar for airports; navigation aids; test equipment to detect metal fatigue etc.

D

Decca Navigator Co. Ltd., New Malden:
Mark 7, Mark 8 and Mark 10 airborne receivers with standard and lightweight Flight Log displays; Dectra and Delrac long-range navigation systems; air survey equipment.

Decca Radar Ltd., London:
Ground and airborne radar units including navigational and approach aids; airfield surveillance (Airfield Control Radar Type 424), airfield surface movement and meteorological radars (Type 40) etc.

Dowty Equipment Ltd., Cheltenham:
Undercarriages embodying Liquid Springs; "Vardel" hydraulic pumps; control valves; switches; indicators.

Dowty Fuel Systems Ltd., Cheltenham:
Fuel pumps embodying overspeed governors and automatic density control; spill burners and control units for gas turbines etc.

Dowty Seals Ltd., Nr. Tewkesbury:
High-pressure sealing rings and grommets in natural, synthetic and silicon rubber; leakproof washers; lock washers and bolts.

Dunlop Rubber Co. Ltd., Coventry:
Aircraft tyres, wheels and brakes; "Maxaret" anti-skid units; brake controls; air compressors; jet engine controls; rubber accessories; hose for low and high working pressures.

Dunlop Special Products Ltd., Birmingham:
Aircraft assembly adhesives; instrument panel mountings; "Dulon" leathercloth for upholstery and panelling etc.

E

Electro-Hydraulics Ltd., Warrington:
Aircraft undercarriages and related equipment; hydraulic and pneumatic equipment; pumps, valves and electro-hydraulic components; flying controls.

Elliott Brothers (London) Ltd., London:
Flight instruments and control systems; flowmeters; accelerometers; servo components; computers; radio, radar and electronic equipment.

English Electric Co. Ltd., Aircraft Equipment Division, Bradford:
Complete electric systems for aircraft; AC and DC generators; motors; rotary and linear actuators; inverters; blowers; electronic computers and flight simulators.

Esso Petroleum Co. Ltd., London:
Aircraft fuels and aviation turbo oil, etc.

F

Ferranti Ltd., Edinburgh:
Gyro gunsights for fighter installation; hit indicator equipment; high-speed tape readers using photo cells; DME airborne interrogators; computers; silicone diodes and klystons.

Firestone Tyre & Rubber Co. Ltd., Brentford:
Tyres and inner tubes for aircraft use; vibration dampeners; engine mountings and other rubber-to-metal bonded parts.

Firth-Derihon Stampings Ltd., Sheffield:
Drop forgings; Nimonic alloys; titanium and special alloy steels for engine and airframe components.

Firth-Vickers Stainless Steels Ltd., Sheffield:
"Staybrite" stainless, heat and creep-resistant steels for aircraft industry; cast components for gas turbines etc.

Flight Refuelling Ltd., Nr. Blandford:
Probe and drogue flight refuelling systems and related equipment.

Folland Aircraft Ltd., Southampton:
Folland-Saab light-weight ejector seat.

G

General Electric Co. Ltd., London:
Electrical services for aircraft; Pirelli-General aircraft cables; G.E.C. heavy alloy; airport electrification, lighting equipment.

Sir George Godfrey & Partners Ltd., Hanworth:
Pressurizing and air conditioning equipment; cold air units; water extractors; test rigs for cold air units and turbo-alternators; pressure testing trolleys and air conditioning trolleys.

Goodyear Tyre & Rubber Co. Ltd., Wolverhampton:
Aircraft tyres, tubes, wheels and brakes; anti-skid equipment; crosswind landing gears.

Graviner Manufacturing Co. Ltd., Colnbrook:
Fire detecting and warning systems for airborne applications; explosion protecting systems.

G.Q. Parachute Co. Ltd., Woking:
Personnel and brake parachutes; air ventilated crew clothing etc.

H

Heenan and Froude Ltd., Worcester:
Mobile jet test benches for field use etc.; test plants for propeller turbines, turbojets and piston engines.

High Duty Alloys Ltd., Slough:
Die castings, forgings, stampings, pressings, extrusions, etc. in "Hiduminium" and "Magnuminium" alloys; compressor blades in "Hiduminium", turbine blades in aluminium bronze and "Nimonic".

H.M. Hobson Ltd., Wolverhampton:
Fuel metering equipment; carburettors; fuel injection pumps; hydraulic power flying controls; gas turbine engine accessories.

Hordern-Richmond Ltd., Haddenham:
"Hy-du-lignum" laminated compressed wood; "Hy-du-lignum" jigs and tools; helicopter rotor blades; cooling fans and "Aeromatic" propellers.

Hymatic Engineering Co. Ltd., Redditch:
Pressure regulating equipment; pneumatic equipment etc.; fuel tank valves; airborne compressors.

I

Imperial Chemical Industries Ltd., Metals Division, Birmingham:
Titanium and titanium alloys; aluminium and aluminium alloys; copper and copper alloys.

Imperial Chemical Industries Ltd., Paints Division, Slough:
Aircraft finishes and related products; "Du-Lite" light-weight finishes; paint remover; metal pre-treatment products.

Imperial Chemical Industries Ltd., Plastics Division, Welwyn Garden City:
Plastics for all purposes.

Farnborough

Irving Air Chute of Great Britain Ltd., Letchworth:
Parachutes, clothing and rescue equipment; ribbon parachutes.

J

Jablo Propellers Ltd., Croydon:
Light-weight plastics materials for thermal and sound suppressing insulation ("Jablex" and "Jablik"); "Jablon" light-weight non-inflammable plastics for upholstery etc.

William Jessop & Sons Ltd., Sheffield:
High temperature austenitic and ferritic steels for application in gas turbine engines; aircraft components in titanium and titanium alloys.

K

K.L.G. Sparking Plugs Ltd., London:
Sparking plugs and ignition accessories; thermocouples; special igniters for turbine starters.

Kelvin & Hughes (Aviation) Ltd., Barkingside and Basingstoke:
Aviation, flight, navigational and engine instruments, including Machmeters, aircraft periscopes, stall detectors (Youngman detector and Bathwaite detector).

Walter Kidde & Co. Ltd., Northolt:
Dinghy inflation mechanisms and life jacket inflators; oxygen breathing apparatus; fire extinguishers etc.

L

Lockheed Hydraulic Brake Co. Ltd., Leamington Spa:
Self-contained actuators; hydraulic pumps and general aircraft hydraulic equipment; undercarriage equipment; "Servodyne" hydraulic flying controls.

Lodge Plugs Ltd., Rugby:
Aviation plugs for piston engines; igniter plugs for gas turbines.

Joseph Lucas (Gas Turbine Equipment) Ltd., Birmingham:
Fuel pumps; control systems; combustion equipment; heaters, hydraulic pumps.

Joseph Lucas (Batteries) Ltd., Birmingham:
Aircraft batteries for heavy duty conditions; batteries for ground starting units.

M

M.L. Aviation Co. Ltd., Maidenhead:
Autopilots; brake parachute releases and hood jettison mechanisms; mobile air conditioning and pressure testing units for aircraft cabins.

Marconi Instruments Ltd., St. Albans:
Telecommunication test equipment for checking performance of airborne and ground based radio installations; X-ray units for inspection of airframes, gas turbines, etc.

Marconi's Wireless Telegraph Co. Ltd., Chelmsford:
Aeronautical telecommunications and navigational aids; approach and airfield control radar; sub-miniature automatic direction finders, etc.; high-power storm detecting radar for fixed or mobile installation.

Martin Baker Aircraft Co. Ltd., Nr. Uxbridge:
Fully automatic ejection seats and special seats for low-level ejection; mobile ejection seat trainers.

Mond Nickel Co. Ltd., London:
Nickel alloy sheets; nickel iron alloys; light alloys, etc.

Mullard Ltd., London:
Electronic tubes; industrial counting and timing systems; germanium diodes, etc.; radar sonde systems for fully automatic weather observation; SL. 21 radar trainers.

Murphy Radio Ltd., Welwyn Garden City:
Radio and radar communications and navigational equipment for airborne and ground installations; passenger announcement systems; voltage regulators; VHF multi-channel airborne transmitter-receivers; VHF radiotelephones; "Rebecca Mk. 8" miniature navigational aid for use in single-seat aircraft.

N

D. Napier & Son Ltd., Acton, London:
"Spraymat" surface heater de-icing equipment.

Normalair Ltd., Yeovil:
Refrigeration turbines and cabin pressure regulators; temperature controls; humidifiers; oxygen demand regulators and liquid oxygen converters.

P

Palmer Tyre Ltd., London:
"Silvoflex" high-pressure hose unit for hydraulic and pneumatic controls and pressure fuel systems; aircraft and helicopter tyres; wheel and disc brakes; rudder bar differential brake control assemblies etc.

Plessey Co. Ltd., Ilford:
Liquid-fuel turbine and pneumatic engine starters for aircraft gas turbines; hydraulic pumps and hydraulic power packs; fuel pumps; windscreen de-icers; HF transmitters and VHF receivers; actuators; VHF transmitter-receiver equipment for personal aircraft.

Pye Ltd., Telecommunications Division, Cambridge:
Radio navigational equipment, including ILS systems; communications equipment for ground-to-air control, vehicle control and point-to-point services.

Pyrene Co. Ltd., London:
Aircraft fire fighting and safety equipment; aircraft crash and fire tender.

R

R.F.D. Company Ltd., Godalming:
Rescue and survival equipment; gunnery training equipment, etc.

Redifon Ltd., London:
Radio communications equipment; flight simulators and synthetic training devices for aircrews.

Rotax Ltd., London:
AC and DC electrical systems; starting systems and high energy ignition units; inverters; motors, etc.

Rotol Ltd., Gloucester:
Aircraft propellers and related equipment; air turbines and ram air turbine drives; accessory drive equipment.

S

Saunders-Roe Ltd., East Cowes:
Analogue computers and related accessories.

Sciaky Electric Welding Machines Ltd., Slough:
Resistance welding machines (spot, stitch and seam welding processes).

Short Brothers & Harland Ltd., Belfast:
Analogue computers; flight handling simulators; hydraulic power controls etc., aircraft passenger seats.

Siebe, Gorman & Co. Ltd., Chessington:
Aircraft oxygen breathing equipment; oxygen regulators and portable oxygen sets, etc.; safety belts; breathing units for fire-fighting crews; protective clothing for fire-fighting.

Silentbloc Ltd., Crawley:
Anti-vibration mountings; flexible bearings and couplings.

Simmonds Accessories Ltd., London:
Specific gravity meters, flow meters, etc.; electronic fuel contents gauges.

Smiths Aircraft Instruments Ltd., London:
Smiths Flight System, composed of autopilot, Smiths Twin Compass System, Twin Gyro Vertical and Comparator Unit, and various cockpit instruments.

Solartron Electronic Group Ltd., Thames Ditton:
Radar simulators for training ground and flying radar operators.

Sperry Gyroscope Co. Ltd., Brentford:
Aircraft gyroscopic flight instruments; navigational equipment and automatic controls etc.

Standard Telephones & Cables Ltd., London:
Communication and navigation equipment for ground and airborne use; TACAN navigation system; thermistors for temperature measurement suitable for use in aircraft control systems; "SenTerCel" light-weight rectifiers and "SenTerCet" aircraft engine starting equipment; synthetic radar trainers.

T

Tecalemit Ltd., Plymouth:
Fuel and oil filters; metering pumps; ground servicing equipment, etc.

Thermionic Products Ltd., Southampton:
Multi-channel recording equipment for air traffic control applications.

U

Ultra Electric Ltd., Acton, London:
"Sarah" air-sea rescue system; turbine servo controls etc.; communication control equipment.

V

Venner Ltd., New Malden:
Emergency lighting units; navigational flashers, etc.

Venner Accumulators Ltd., New Malden:
Silver-zinc light-weight accumulators.

W. Vinten Ltd., London:
Low-altitude reconnaissance cameras; cine-gun cameras and take-off cameras, etc.

W

Westinghouse Brake & Signal Co. Ltd., London:
Rectifiers for aircraft power supplies; radio, radar and communications equipment; ground power units for engine starting.

Henry Wiggin & Co. Ltd., Birmingham:
High-nickel alloys for corrosion and heat-resisting applications, such as "Nimonic" series.

Williamson Manufacturing Co. Ltd., London:
Reconnaissance cameras; gun cameras and stereoscopic mapping instruments.

Saro *Skeeter 6* light helicopter, which is to be built in large numbers for the Army and the R.A.F.

A Westland *Whirlwind* helicopter alights on the water to test its new flotation unit.

described as "guided weapons carriers." How far Britain is prepared to show the public the latest developments in this field will be revealed at Farnborough in the first week of September. It is, however, certain that there will be few new military aircraft at the S.B.A.C. Display.

Despite the budget cuts, several notable military development contracts have been placed recently. In addition to producing the *Vulcan* V-bomber in some quantity, *A.V. Roe* is said to be working on a supersonic bomber for speeds of around Mach 2 and altitudes of more than 50,000 ft. This bomber is expected to be operational in the early sixties. *Bristol,* whose military programme includes extensive guided weapon developments, is reportedly also working on a supersonic aircraft, equally to be suitable for speeds in the region of Mach 2.

The *English Electric Canberra* seems still to have a long career ahead of it. It is still in production in various versions and is being built not only for Britain's own use but also to a constantly increasing extent for export purposes. New versions are expected to be announced shortly. The English Electric P.1 twin-jet fighter has also come up to expectations. R.A.F. orders will be announced shortly, and later developments (perhaps with auxiliary rocket motor) are planned.

Development orders for new versions of the *Gannet* turboprop anti-submarine aircraft have been placed with *Fairey Aviation Co. Ltd.;* these are reported to include a radar early warning version. *Handley Page* is turning its main attention to large supersonic aircraft for military (and civil) use, while *Vickers' Supermarine Division* is beginning production of the N.113D carrier-borne fighter. This aircraft is to carry tactical A weapons and—in later versions—guided missiles.

Bristol's helicopter production is concentrated at the Weston-super-Mare plant. Picture shows production of the single-rotor Bristol 171 *Sycamore.*

Programme of selected airframe manufacturers

Armstrong Whitworth: Extensive work on guided missiles; reportedly working on a supersonic project; building Hawker *Sea Hawk* naval fighter for Germany.

Aviation Traders: Charter air transport operations; sub-contracts (Bristol *Freighter*) and conversion work led to development of *Accountant* feeder and executive transport aircraft; Mark 1 prototype (in final assembly) designed primarily as business aircraft, larger Mark 2 for passenger/cargo operation.

A.V. Roe: Production of *Vulcan* V-bomber; extensive guided missiles programme; development of a bomber for Mach 2 at 50,000 ft. plus, for early sixties.

Bristol: *Britannia* scheduled for B.O.A.C. service in October; medium-stage version offered for about 1958; structurally reinforced version with *Orion* engines could reach cruising speeds around 460 m.p.h. Series 400 for 130 passengers under consideration. — Work continuing on turboprop-powered type 187 for very long ranges. — Production of type 171 *Sycamore* helicopter in various versions; types 173 (civil), 192 (for R.A.F.) and 194 (civil) twin-engined helicopters. — Guided missiles.

Blackburn & General Aircraft: *Beverley* transport now in R.A.F. service; civil version offered. Later developments possibly with *Eland, Tyne* or *Orion* turboprops. — Reported development of a supersonic naval low level strike aircraft.

de Havilland: *Dove* and *Heron* still in production; production of D.H. 110 for Fleet Air Arm. — *Comet 4* and *4A* ordered by B.O.A.C. and Capital Airlines; development of *Comet 4* with Bristol *Olympus* or Rolls-Royce *Conway* under consideration. — D.H. Propellers working on air-to-air guided missile with infra-red heat homing head and on propellers for turboprop aircraft with speeds of up to 500 m.p.h.

English Electric: *Canberra* production still in full swing; further export orders and new versions expected. — R.A.F. orders for P.1 fighter due shortly; later models (possibly with auxiliary rocket motor for improved altitude performance) probable. — Large-scale guided missiles programme.

Fairey Aviation: Flight test programme continuing on FD-2 research aircraft; *Gannet* anti-submarine aircraft in production and further developments in hand (e.g., radar early warning version). — *Rotodyne* rotary-wing prototype in final assembly; work continuing on ultra-light helicopter. — Several guided missiles, including *Fireflash*.

Gloster Aircraft: *Javelin* all-weather fighter in R.A.F. service in several versions; can carry guided missiles; development contract for supersonic version of Javelin (thin wing plus *Olympus* engines) cancelled.

Handley Page: Tooling up for production of 100 *Heralds*. — *Victor* V-bomber shortly going to R.A.F. — Project work concentrated on large supersonic aircraft (civil and military).

Hawker Aircraft: *Hunter Mark 6* going into squadron service; later versions to carry *Fairey Fireflash*.

Saunders-Roe: *Skeeter* light helicopter in production for Army and R.A.F.; development with larger cabin planned. — Saro SR.53 delta-wing fighter (assumed to be powered by *Spectre* rocket plus *Gyron Junior* jet) in final assembly. — Flying boat project continuing (atomic power plant). — Wings for all *Viscounts* under sub-contract.

Short Brothers & Harland: *Seamew* production for Fleet Air Arm. — PD.11 experimental VTO aircraft in final assembly. — Production of several marks of *Canberra* and of *Britannia 300*. — Guided missiles programme of growing importance.

Scottish Aviation: Preparation for production of 200 *Twin Pioneers*.

Vickers-Armstrongs: Large-scale production of *Viscount*. Preparations for *Vanguard*. Pure jet aircraft under consideration. — Extensive work on guided missiles, experiments with new wing shapes and boundary layer control systems. — *Valiant* V-bomber in squadron service; production being phased out.

Vickers-Supermarine: *Swift* production being phased out, with exception of last version, built as guided missile carrier. — Production of N.113D navy strike fighter beginning.

Westland Aircraft: Main emphasis on helicopters: S-51, S-55 and recently, S-58 *Wessex* with Napier *Gazelle* for Royal Navy.

The Napier *Scorpion NSc.1* liquid propellant rocket motor fitted in the belly of a *Canberra* for flight tests.

Farnborough

A converted *Lincoln* is used as flying test bed for the Rolls-Royce *Tyne* propeller turbine.

Programme of selected engine manufacturers

Alvis Ltd.: Production of *Leonides* and *Leonides Major* piston engines; interest in market for helicopter turbine engines.

Armstrong Siddeley: *Mamba and Double Mamba* turboprops still in production, also *Sapphire* and *Viper* turbojets. Work on *Snarler* and *Screamer* rocket motors.

Blackburn & General Aircraft: Development of Turboméca turbine engines, in particular with regard to increased use of standard components and improved operating life between overhauls.

Bristol Aero Engines: *Orpheus* jet now delivers 4,850 lbs. of thrust; probably to be developed to 6,000 lb. thrust class. Manufacturing rights sold to France and Italy. — *Olympus* turbojet may be developed to 19,000 lbs. thrust by 1958/59; in production for Avro *Vulcan* V-bomber. — *Proteus 755* turboprop in production (for *Britannia*); testing of BE. 25 *Orion* turboprop with satisfactory results; *Orion*, among others, to be shown at Farnborough. — Another turbojet (at least 20,000 lbs. thrust) under development according to American sources; work on ramjet engines; *Thor* ramjet to be shown at Farnborough.

de Havilland Engine: *Gyron* and *Gyron Junior* jets, the latter in the 8,000—10,000 lbs. thrust class. *Gyron Junior* mentioned in conjunction with *Spectre* rocket motor for Saro 53; interest also reported in *Gyron Junior* plus *Super Sprite* combination. — Work on other rocket motors, including *Super Sprite* for V-bombers.

D. Napier & Son: Gas turbines for helicopters and fixed-wing aircraft; *Oryx* under consideration by U.S. Army; *Gazelle* going into production for the Westland *Wessex* and Bristol 192 helicopters and arousing interest in United States. — *Eland* turboprop so far completed 1,000 flying hours (in *Ambassador*, *Varsity* and *Convair* 340). Convair plans to fit *Elands* to later *Metropolitans*. — Work on ramjets and rocket motors, e.g., *Scorpion*.

Rolls-Royce: *Dart* turboprop to be developed to 3,000 h.p. take-off power; scheduled for installation in later *Viscount* versions in early sixties. — *Tyne* turboprop being flight tested in *Lincoln*; three development stages planned: original estimate set the power of the first production version, due in 1959, at 4,470 e.h.p. (stage one), of the 1961 version at 5,075 e.h.p. (stage two) and of the 1963 version at 5,500 e.h.p. (stage three). Results so far obtained enable these figures to be raised by 5%, while specific consumption values have been reduced by 3%. *Tyne* scheduled for *Vanguard*, possibly also for *Electra*. — Further orders for *Conway* jet expected for DC-8 and Boeing 707; *Conway* also for later versions of Handley Page *Victor* and possibly *Comet* developments. — Research on thrust reversal; special engines for VTOL aircraft; development of rocket motors. — Erection of new high-altitude engine research laboratory at Derby.

Generally speaking, the development of British military aircraft is moving along lines already largely known. Innovations are limited to the application of recent technical advances, such as jet flaps, various systems of boundary layer control, new wing shapes etc. A number of short take-off and landing designs, as well as turboprop-powered models for vertical take-off and landing are under development. According to their makers, these aircraft will be suitable for both military and civil use.

The trump card: engines

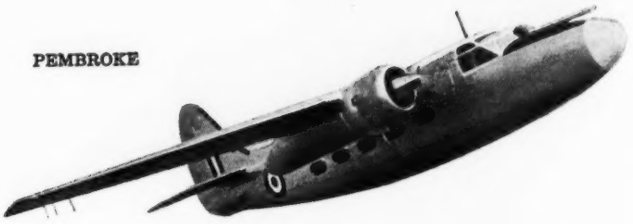
The leading position which Britain's aircraft engine industry has already held for several decades has been still further strengthened. Through the sales of *Viscount* airliners (Rolls-Royce *Dart* engines) and *Britannias* (Bristol *Proteus*) to foreign airlines, *Rolls-Royce* and *Bristol Aero Engines* have strengthened their position on the international market. Bristol has also recently been negotiating with various aircraft manufacturers and airlines on the possible installation of a civil version of the *Olympus* jet in future transports of the DC-8 and Boeing 707 class. The firm has another favourite in the *Orpheus* turbojet, manufacturing rights for which have already been sold to France and Italy. American, Indian and Japanese aircraft manufacturers are also showing interest in this light-weight engine.

Rolls-Royce has been able to assemble valuable operating experience in regular air transport with the *Dart* propeller turbine, which is fitted, for example, in the *Viscount*. The *Darts* already have over a million operating hours to their credit and by the end of 1959 they are expected

(Continued on page 691)

The de Havilland Engine Company's production programme includes the *Super Sprite* rocket motor for the Vickers *Valiant*; the latter carries two *Super Sprite* units, which are jettisoned after burnout.

PEMBROKE



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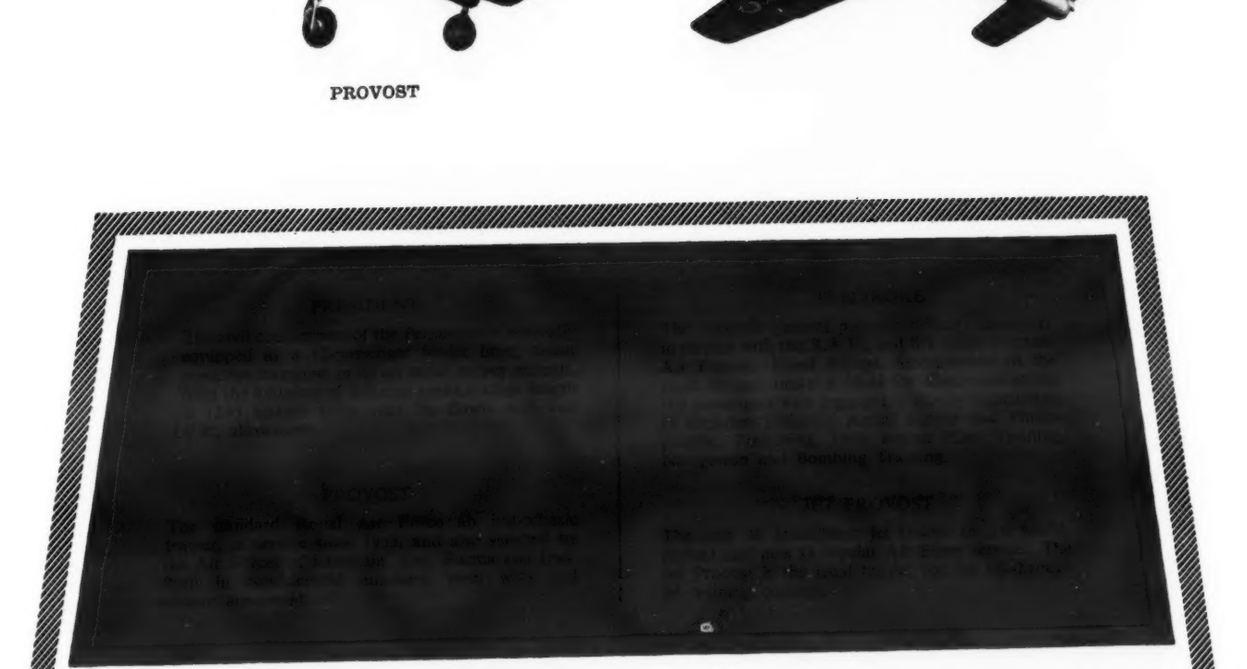
JET PROVOST

PROVOST



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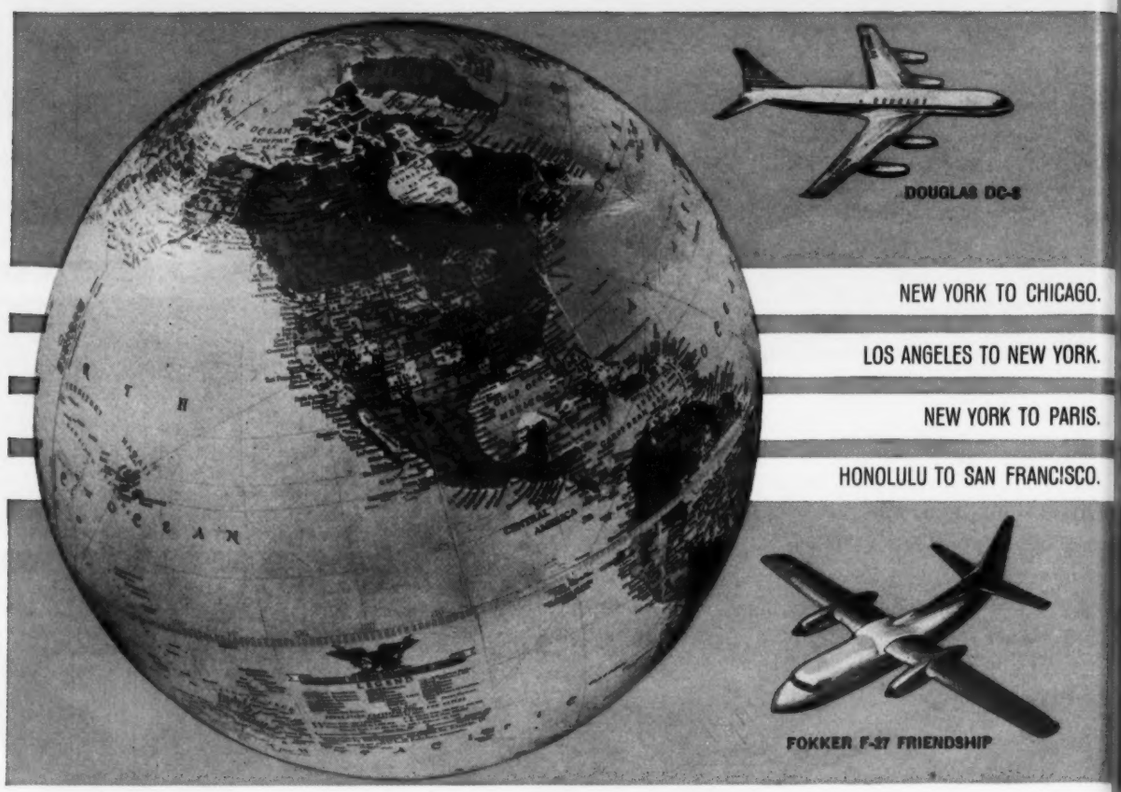

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When you and your family board these new jet airliners, you'll be stepping into a completely new era of transportation designed to get you where you are going faster, more comfortably and more dependably. To appreciate the progress that has been made, following are some exclusive jet problems that had to be licked and some original answers to those problems worked out by Bendix Aviation Corporation.

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Igniting a jet is like lighting a match in a tornado. An ordinary spark has no chance. New Bendix jet ignition produces a super spark that fires jet engines immediately.

Jets are fuel hogs with very sensitive digestive systems. Not too much, not too little—the mixture's got to be just right. Speed, temperature and altitude affect this mixture. Thus, fuel-air proportions must be changed rapidly and automatically. New Bendix* fuel-metering and engine control systems are precise and automatic, take another tough problem off the crew's backs.

Jet speeds necessitate more accurate navigation and piloting. Here several exclusive Bendix devices team up for greater precision: The

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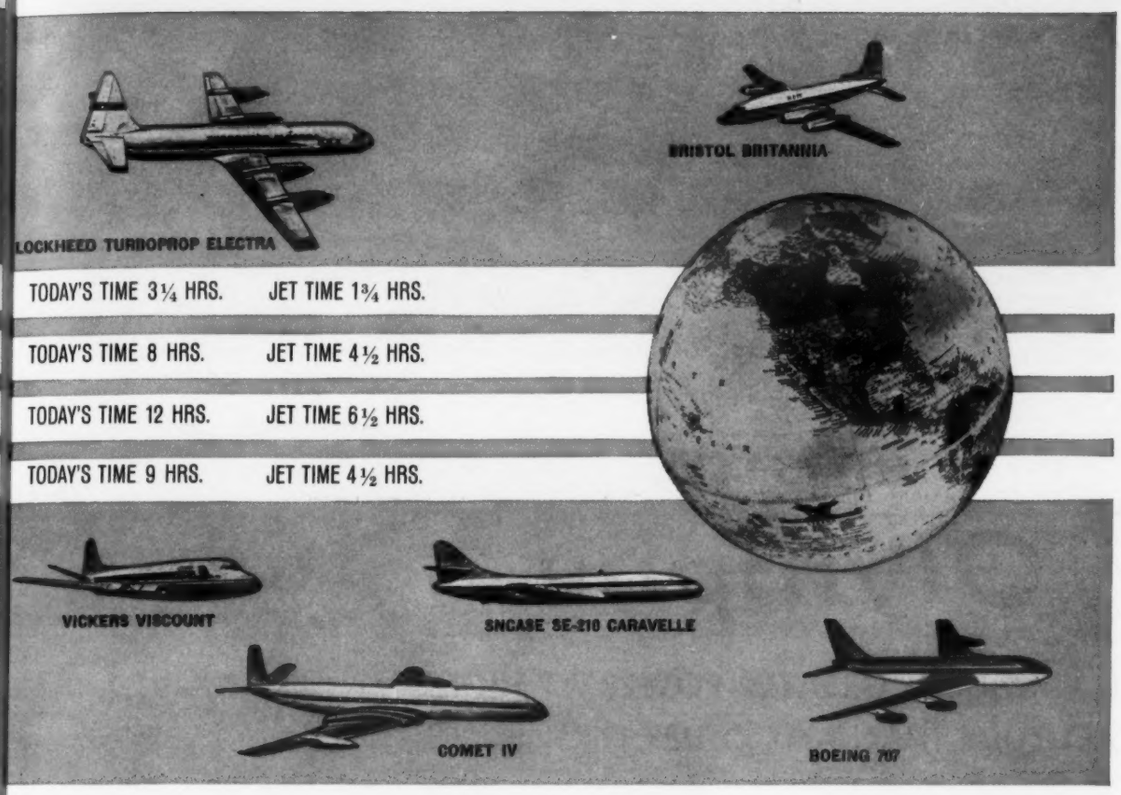
COMPLETE TRANSISTORIZED NAVIGATION AND CONTROL SYSTEM
Includes automatic pilot capable of automatic landing approaches; Flight Director systems; heading reference systems.

AIRBORNE RADAR SYSTEM
Sees storms 150 miles away and shows how to avoid them for smoother ride.

RADIO COMMUNICATION SYSTEM
Including receivers, transmitters, flush antennae, radio compass, radio magnetic indicators, marker receivers, glide slope receivers, VOR-localizer receivers, Omni-mag indicators, cockpit loud speaker, distance measuring equipment, transponder beacon and selective calling, passenger address and transistorized interphone systems.

LIQUID OXYGEN SYSTEM
Automatic high-altitude oxygen system for passengers plus flight crew oxygen system.

SPECIAL INSTRUMENTS
To measure Mach airspeed and fuel flow; accelerometers; specially lighted turn-and-bank and rate-of-climb indicators.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BRISTOL BRITANNIA
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TODAY'S TIME 8 HRS. JET TIME 4½ HRS.
TODAY'S TIME 12 HRS. JET TIME 6½ HRS.
TODAY'S TIME 9 HRS. JET TIME 4½ HRS.
VICKERS VISCOUNT
SNCASE SE-210 CARAVELLE
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Including wheels, brakes, shock absorbers and "Cerametalix" brake lining—our special friction material developed for stopping jets.

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Including fault-detecting and regulating devices and inverters.

RELIABLE, RUGGEDIZED ELECTRON TUBES

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Provides extra hot spark for starting and high altitudes.

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Provides proper air-fuel mixture at all speeds, temperatures and altitudes.

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For raising and lowering landing gear, applying boost power to control surfaces. Includes servo-valves, accumulators, positioning actuators, pressure reducers, relief valves, hand pumps, flow dividers and cylinders.

Polar Path* compass, which made polar navigation practical and which is equally accurate anywhere; the Flight Director, a simplified navigation system in which two instruments replace many; and the first completely transistorized automatic pilot which will not only fly jets with more exactness than human pilots but automatically bring them in for pinpoint landing approaches.

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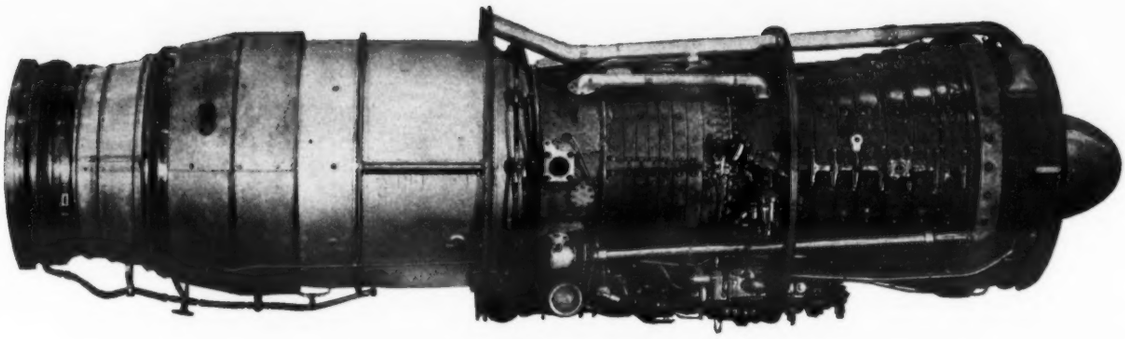

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★ IT PRODUCES **GREATER POWER AT HIGHER ALTITUDE** THAN ANY OTHER ENGINE.

★ IT IS **MORE POWERFUL THAN ANY OTHER ENGINE** IN FULL-SCALE PRODUCTION IN GREAT BRITAIN.

★ AT CRUISING ALTITUDE **ITS FUEL CONSUMPTION IS LOWER THAN THAT OF ANY OTHER BRITISH TURBOJET** OF COMPARABLE POWER.

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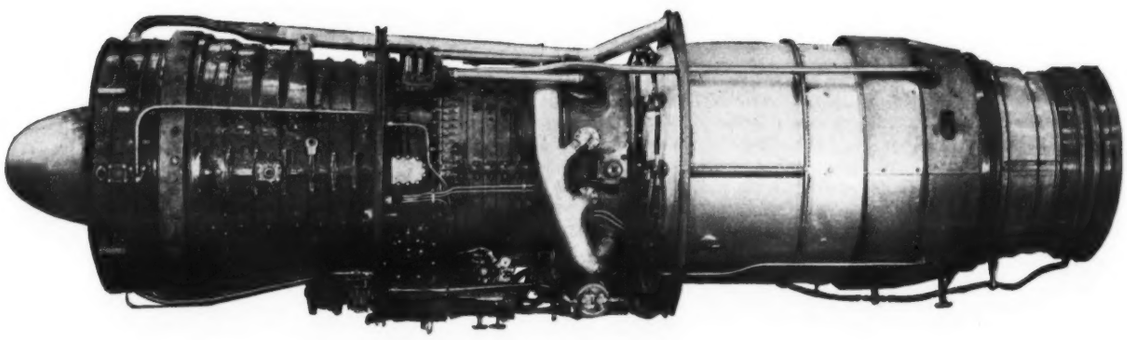
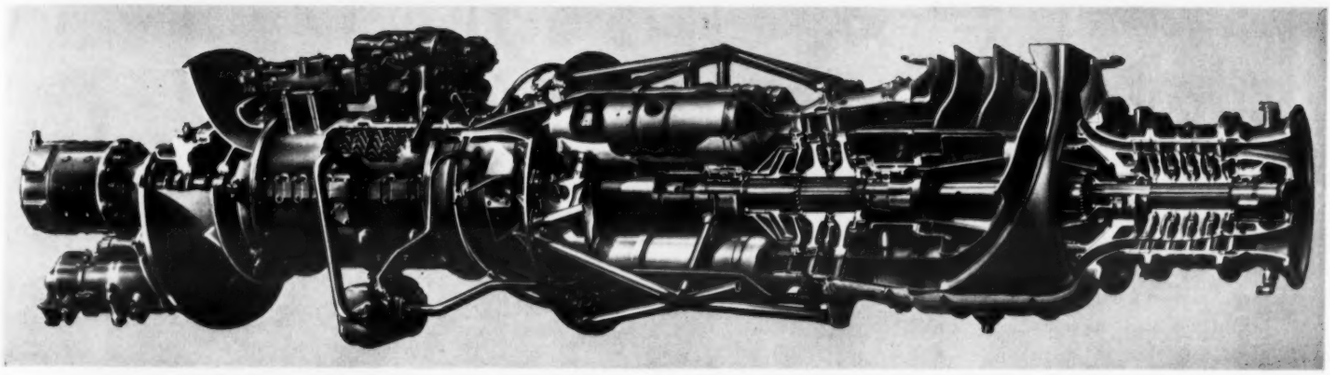
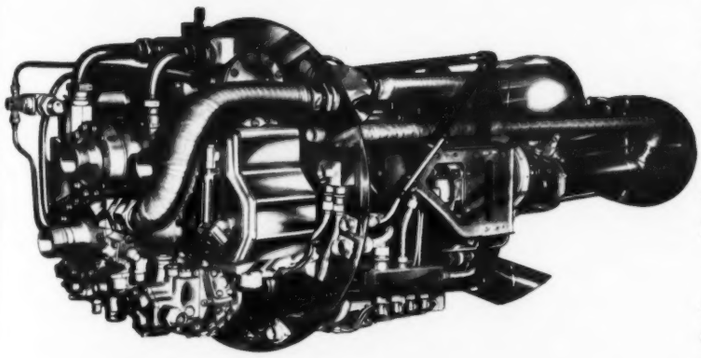
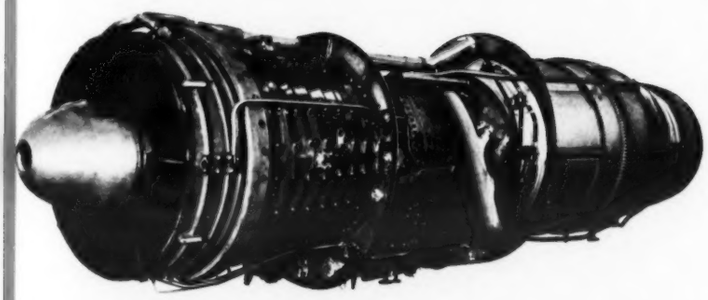
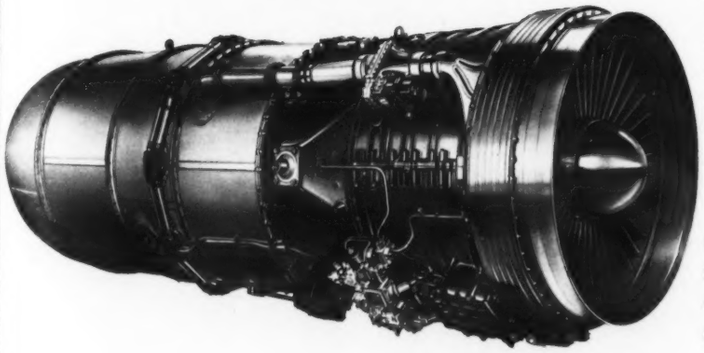










Napier *Oryx* turbo gas generator for helicopters (top), the latest NOr.4 version of which recently made a 150-hour type test at 865 gas h.p. – Bristol *Orpheus* (top left), envisaged for the Folland *Gnat*, Fiat G.91, Dassault *Etendard VI* etc. – Armstrong Siddeley *Screamer* rocket motor of 8,000 lbs. thrust (centre left). – Bristol *Olympus 102* turbojet, now in production, is certificated for a thrust of 12,000 lbs. – Rolls-Royce *Conway RCo. 5*, which has passes a type test at 13,000 lbs. thrust, is also in production.

to have raised this figure to ten millions. Then for 1960 the Rolls-Royce *Conway* jet will be ready for civilian service; it is to be fitted, for example, in the four Douglas DC-8s ordered by Trans Canada Air Lines. Rolls-Royce also expects other airlines to specify *Conways* for their DC-8s and probably their Boeing 707s. In addition, there should be good export prospects for the *Tyne* propeller turbine, which is now being flight tested. Already ordered for the Vickers *Vanguard*, this engine has aroused interest in the United States. Reportedly there are plans to fit the Lockheed *Electra* with *Tyne* engines. Finally, mention should be made of the firm's latest sales success: the fourteen *Comet 4s* and *4As* for Capital Airlines (as well as B.O.A.C.'s nineteen *Comet 4s*) are to be powered by Rolls-Royce *Avon RA.29s*.

Thus several British aircraft engine manufacturers have succeeded in entering the American market. Though a considerable number of engine licences were sold to American producers in earlier years, the situation today is a slightly different one. A number of American aircraft, which were originally to have been fitted with American engines, are now to have British gas turbines. This applies not only to Rolls-Royce and Bristol, but also to *D. Napier & Son,* whose *Eland* propeller turbine has been chosen for later installation in the medium-stage Convair *Metropolitan*. There are also good prospects that the Napier *Oryx* and *Gazelle* gas turbines, which were developed primarily for helicopter use, will be used in the United States.

*

Summing up, it may be said that the British airframe industry is turning its attention increasingly to the production of civil aircraft. Main stress is being placed on turboprop-powered models, though the possibilities of the pure jet airliner are being watched attentively. Several projects and prototypes for STOL and VTOL aircraft are in hand, and new methods of boundary layer control, devices for reducing take-off and landing distances (jet flaps) and a number of wing shapes, some of them unconventional, are being investigated. Finally, work is continuing on several special engines for vertical take-off aircraft.

The British aircraft industry as a whole is making its most strenuous efforts in the field of guided missiles. Last but not least, the equipment and electronics industry—whose products will be discussed in greater detail in the report on the Farnborough Show—has made an essential contribution towards opening up the civilian market to British aircraft.

Farnborough

Scheduled Helicopter Services — Problems and Prospects

By R. H. Whitby, Performance and Analysis Manager, British European Airways, London

The first Bristol 173 twin-rotor helicopter was handed over by Peter Masefield, Managing Director of Bristol Aircraft Ltd. (left), to Lord Douglas of Kirtleside, Chairman of British European Airways (right), on July 20th, 1956.

The pattern of air transport appears to be shaping itself more clearly: turbojet aircraft on the long and medium range sectors and the turboprop on long, medium and short range sectors with, however, for many years to come a supplement of piston engines.

On the one hand, the growth of traffic tends to increase the intensity of movements, while on the other refinement of the aircraft and the growing complexity of operation tends towards a limited number of airports and to an increase in their distances from centres of population. So that as wide a population as possible can enjoy easy and frequent access to the ever-developing aeroplane services, airports must be fed from the centres of population throughout the country.

For many years the helicopter has been visualised in this role as well as that of city to city transport, where it would be in competition with well established surface transport. The questions posed by commercial scheduled helicopter operations follow from the above considerations. They are:

— Can the helicopter be got into the city centre?

— Can it operate with regularity?

— Can it operate commercially?

City Centre Operation

The answer to the first question depends on the aircraft and on less tangible social and commercial factors. In the first place, it must be possible to deal with an engine failure in all flight conditions. The provision of true multi-engine civil helicopters has been long deferred by the fact that all civil helicopters so far have been primarily designed for military purposes and under the stimulus of war operations.

In the second place, the helicopter must not be excessively noisy in operation or the general public can reasonably refuse its entry into the built-up area. This is a matter of careful detail design in the case of gear driven helicopters and of special development work such as is under way in the case of directly driven rotors making use of rotor tip combustion.

As to the provision of city centre heliports in the United Kingdom, the preparation of suitable sites or the provision of buildings from which the helicopter can be operated has been inhibited by the paucity of helicopter operations, and by the fact that until recently no multi-engine machine has been available. However, in the U.S. in particular the preparation of some city centre heliports is well advanced, and a major step was taken by I.A.T.A. during 1955 when it set down the characteristics of sites which it considered could be made available in practice.

Regularity of Operation

The standard of regularity that must be expected from the helicopter is at least that of the aeroplane. The problems which are involved are those of instrument flight, operation in icing conditions and the provision of suitable navigation and approach aids.

It is believed that the introduction of auto-stabilisation by means of autopilots, on which a great deal of experience has been obtained on military models, will give the helicopter handling qualities as generally satisfactory as the aeroplane. The airworthiness aspects of dependence upon the reliability of "black boxes" will require careful consideration, but this should present no insuperable problem.

With respect to icing, development work on liquid, electrical and thermal methods is going on in a number of places; it remains to be found through practical operations which method is the least costly.

With respect to navigation and approach aids, B.E.A. in particular has made considerable investigations in this direction, and it is considered that the Decca Navigator system can meet the requirements of a navigational aid, possibly supplemented by another aid during the approach.

Taken all in all, it is considered that fairly quickly after the introduction of a multi-engine all-weather helicopter regularities comparable to those of the aeroplane can be achieved.

Commercial Operation

The helicopter, looked upon as the supplement to the aeroplane, can be employed in two major ways. On the one hand, over very short sectors the helicopter is used to link metropolitan airports with each other and with the main points in the city served. In this case, the distances involved are relatively short so that the total value of the fare will not be large and a high cost per seat mile is acceptable. This is the form of operation in which New York Airways are engaged.

In the other type of operation the helicopter feeds a major airport from provincial centres and attracts air travellers who would otherwise be lost, thereby justifying a measure of subsidy from the aeroplane. This is the pattern of Sabena's extensive network of helicopter services and also on a more modest scale of B.E.A.'s current service linking Leicester and Nottingham with the airport of Birmingham.

Studies have recently been made of a number of operating and projected helicopters, and it

is found that there is a definite trend of decreasing operating cost with increasing size. The level of direct operating costs estimated is as follows:

Passenger seats	Direct Cost (pence per seat mile; 1 d = approx 1.2 cents)
4	24
10	12
25	6
60	3

For comparison it shall be noted that a 40 to 50 seat aeroplane operating on a 100 to 200 mile stage would cost 2½d to 3d per seat mile.

When B.E.A. started helicopter operations in 1947 it was expected that a multi-engine helicopter would be available for operation in 1950. In the event, this hope proved to be unfulfilled since the development of helicopters, as for any aircraft, is an expensive business and only the military were able to find the money for such development, and their requirements did not envisage a multi-engine aircraft at that time.

In 1951, B.E.A. prepared a specification for a large transport helicopter seating between 40 and 50 people and cruising at about 150 m.p.h. Although technically such an aircraft could have been built so that it would have been coming into service in a year or two's time, financial and other considerations prevented its being made.

The present estimate is that about 1960 there will probably be one or more multi-turbine helicopters based on a well proven rotor and power transmission system of a capacity of around 20 passengers. Such a helicopter might be based on the Sikorsky S-58, the Vertol H-21, the Bell HSL (216), or, in the U.K. on a development of the Bristol tandem rotor family.

It will be seen from the above figures that the expected direct operating costs of such an aircraft would be about 8d to 10d a seat mile, and it was said at the I.A.T.A. San Remo Helicopter Symposium in May of this year that at such a level of costs there would be a ready market throughout the world (about 200 aircraft in the United States alone). So far as the U.K. is concerned, it is doubtful whether at such a cost, which would correspond to an unsubsidised fare in the order of 1/6s. to 2/-s. a mile, there would be a large demand.

However, a helicopter of about double this size, i. e., one which is very closely in line with the B.E.A. 1951 specification, could be expected to permit full economic operation at a fare level roughly that of present international fares, together with a small surcharge to offset the savings on city centre to airport surface fare and to represent a bonus for the speedier journey. Cruising speeds of 150 to 180 m.p.h. could be provided and there is no technical reason why such a helicopter should not be in service by the mid-1960s.

Such a time scale may serve to reinforce the scepticism of those engineers and operators who have from the start regarded the transport helicopter with some misgiving. Recent developments in other directions may have served to reinforce them in their attitude. A large amount of interest has been aroused by short take-off and landing and vertical take-off aircraft.

It is likely, however, that these aircraft will either be unbearably noisy or will require more space than is generally available in a city. They will certainly require a good deal of development and operating experience before they will warrant a Certificate of Airworthiness. In any case, it is by no means clear that they would offer a higher degree of reliability or cheapness in operation than the helicopter.

Now is the time to engage in the development of a civil helicopter, and it is vital to recall that experience has shown time and again that unless adequate facilities for design and development are made available, limited funds are dissipated without effective result.

Equipped to carry 12 to 14 passengers, the Bristol 173 commercial helicopter will initially be used for an extensive training programme. It is described as the predecessor to a 20-seat helicopter with turbine engines, which will probably bear the designation Bristol 194.

I. A. T. A.

Air Transport's Biggest Challenge

By Sir William P. Hildred, C. B., O. B. E.,
Director General, International Air Transport Association

A year ago, the Annual General Meeting of I.A.T.A. spent a little time reviewing the first ten postwar years of international air transport, and derived a little satisfaction from the evidence of rapid growth, from the record of things achieved and many problems solved.

This September at Edinburgh, the 1956 Annual Meeting of I.A.T.A. finds the airlines well into the second postwar decade. A head are new difficulties, new problems and new challenges—bigger ones.

The advent of the jet age has been so resoundingly heralded that it needs little more than mention in this context. But some of its implications do.

There has been much talk about the airlines as media of mass transportation, like railways and steamships. So long as each of our locomotives could draw only 60 or 70 passengers behind them, this has remained somewhat academic. But with the big jet aircraft, capable of producing as much transatlantic passenger accommodation per annum as one of the Queens, we shall soon be mass transporters indeed. At least, we shall have the transport; and we hope to have the masses.

This must have—and is already having—its repercussions on the whole pricing policy of air transport. The industry is well aware that the price of a volume commodity must be kept low in order to tap the widest possible market for it, but the experience of the past year contains a disturbing hint that the price of air transport can be forced to levels which are too low.

It is not my province to suggest here and now what will be an adequate price for jet transport five years hence, but it is important to stress that the price must cover more than direct expenses. The jet aircraft is the most expensive piece of equipment ever to be brought into service, and the cost of a jet fleet increases enormously the basic capital needs of the industry. No matter how any nation organizes its economy, the sources of capital want to see their money back. Investments must be secured by reserves, and the profit margins of international air operations are already too low overall to provide them.

Princes Street, Edinburgh, most famous street of Scotland's capital, where I.A.T.A.'s 12th Annual Meeting is to be held.

This must be stressed because there are three trends of thought which are presently bearing down on the industry and in whose conjunction there is danger.

One is the contention that because cheap tourist transport encourages tourism generally, the airlines should in effect provide the "loss leaders" to subsidize and prime the pump for the rest of the tourist economy.

The second is the understandable but very irresponsible idea that because many people want a thing badly, it should ipso facto be given them for nothing, or nearly nothing.

The third is the assumption that because payloads and capacities, capitalization and expenditure in the airline business are growing to vast proportions, the airlines can afford practically anything. This seems to have taken hold in a number of governments, with the result that while they ask for lower fares, they also demand that we operate without subsidy, that we carry the mail for less and less, that we pay greater charges for airports and navigational facilities.

The jet age brings serious and costly problems for governments as well, and it was heartening to see their decision at the last I.C.A.O. Assembly at Caracas to stand up to the need for the aerodromes, landing aids and air navigation facilities which the jets and the millions of air travellers will understandably need. Caracas showed that the governments were looking ahead to a great future for air transportation.

Other problems will become manifest in the series of reports which will come before the Annual General Meeting at Edinburgh and future General Meetings of I.A.T.A. But I am absolutely sure we can face and solve the problems of the second postwar decade for the simple reason that we have survived and been strengthened by the trials of the first.

The international airline industry has enormously improved in expertise. The structure and flexibility of international cooperation between governments and between international airlines is sturdy and increasingly efficient. And we have had ten year's of schooling in the kind of common sense, tolerance and mutual helpfulness which alone makes international air transport possible.

Some of the Leaders of World Air Transport

1. 2 3 4 5 6

1. Aer Lingus: J. F. Dempsey, General Manager; 2. Air France: Max Hymans, Chairman; 3. Air France: Lo... Lesieux, Director-General; 4. Alitalia: Count Nicolo Carandini, Chairman; 5. Alitalia: Dr. Ing. Bruno Velu... Director-General.

6. Aviaco: ... d'Erlanger, ... Director; 13...

Some Thoughts on Traffic Conferences

By John Brancker, Traffic Director,
International Air Transport Association

Each year the Composite I.A.T.A. Traffic Conference seems to receive increasing attention from the press and the public throughout the world. This of course is quite inevitable and I suspect is merely an index of the very important role which air transport now plays in the life of the ordinary citizen.

What I am going to say is not intended in any way to be a general apologia for Traffic Conferences, nor do I propose to take each point of criticism and to try to refute it lock, stock and barrel. I only hope to show that with all its shortcomings, the principle of establishing fares and rates by means of Conference machinery is probably the best at the present moment.

May I start by saying that no one really likes Traffic Conferences. At one stage or another I have probably seen them from every angle—as the chief delegate for B.E.A. and later B.O.A.C., as chairman of a Composite Conference, and now as Traffic Director of I.A.T.A. I do not think there are any airline delegates who fundamentally enjoy attending these meetings. Airline managements also are naturally not over-enthusiastic about having their staff being away from their home offices for appreciable periods of time, but the airlines undoubtedly realize that they are in fact a very necessary evil.

Secondly, I think it must be emphasized that we are dealing with international carriage, and a commodity of this kind is not susceptible to the sort of treatment or control which might be applied to something of strictly national dimensions. Let us look at some of the main comments in that light. There is a school of thought which holds that any agreement between airlines on fares and rates is wrong in principle and that anything which might be labelled, albeit erroneously, restrictive or a cartel, should be firmly prohibited. Most of the people who support this point of view back their opinion that complete freedom of each airline to fix its own rates and fares independently with the statement that this would be of benefit to the public—the public, of course, really only being those people who are potential customers of air transport. But is this view logical? One wonders how many of the people who strongly support it would be equally ready to see a complete removal of all customs' barriers and tariffs, which would also presumably be of benefit to the public who wish to buy goods at the lowest possible price. I do not think somehow that their answers would be quite the same.

A I.A.T.A. Traffic Conference, at which drastic fare reductions on Atlantic services were decided, was held at the Riviera resort of Cannes in June 1956.

There is of course another point in this respect. Air transport inevitably carries a lot of national prestige, and a complete lack of control of fares and rates would probably not end in the survival of the fittest, but would rather lead to a full subsidy war and the survival of the richest. The public as a taxpayer might be somehow less enthusiastic about this prospect than the public as an airline customer. Most government bilateral agreements, moreover, do stipulate agreement on fares and rates between the national carriers immediately concerned. As almost every rate has a repercussive effect on another, it is not in fact a practical proposition to fix fares and rates between individual pairs of carriers. It can only be done in groups, and groups lead very quickly to the necessity of doing it on a world-wide basis.

Again—and this is unlikely to be forgotten in view of the action which led to the last Conference in Cannes being held in May instead of in September—every agreement made between the airlines must receive government approval, and this fact alone seems to remove many of the dangers which appear to give so much worry to some of the critics.

In all honesty, I think it is difficult to refute completely the accusation that Conferences tend to be restrictive, but I suspect that results are beneficial quite as often as they may appear to be otherwise. The necessity for getting Conference agreement may at times have a delaying effect on the immediate introduction of a new type of service or a new type of fare which may be proposed by one carrier. On the other hand, it also ensures that carriers do not suddenly increase the levels of fares and rates until the whole proposition has been considered carefully and agreed as being essential.

Let us look at another comment which has been fairly widespread. Why do the Conferences meet in secret? The immediate implications are of course that the airlines are ganging up to do something which is injurious to the rest of the world. The real reason is of course a very practical one and does not cover any nefarious motives. It is obviously easier to get good agreements if all the arguments take place across the Conference table and are not carried on simultaneously in the press. Many of the discussions, even of relatively simple subjects,

6. Aviaco: Don José Pazó Montes, Chairman and Director-General; 7. B.E.A.: Lord Douglas, Chairman; 8. B.E.A.: Anthony H. Milward, Chief Executive; 9. B.O.A.C.: Gerard d'Erlanger, Chairman; 10. Deutsche Lufthansa: Hans M. Bongers, Commercial Director; 11. Finnair: Lt.-Gen. Leonard Grandell, President; 12. Hunting-Clan: M. H. Curtis, Managing Director; 13. Iberia: Don Tomás Delgado Perez de Alba, President.

PROGRAMME

of the Twelfth Annual General Meeting

International Air Transport Association

17th to 21st September, 1956

City: Edinburgh, Scotland

Address: Assembly Rooms, Music Hall, George Street

Hosts: British European Airways Corporation
British Overseas Airways Corporation
Hunting-Clan Air Transport, Limited
Airwork, Limited

Guests: About 250 delegates and observers from the I.A.T.A. airlines, from other international organizations and U.K. Government agencies dealing with civil aviation.

September 17th: Official opening in a public plenary session at 11 a.m.; welcome speeches by Harold Watkinson, British Minister of Transport and Civil Aviation and by Scottish and civil dignitaries.
Marshal of the Royal Air Force Lord Douglas of Kirtleside, Chairman of British European Airways, will take office as President of I.A.T.A., succeeding Juan Terry Trippe, President of Pan American World Airways.
Annual Report on the state of the world air transport system by Sir William P. Hildred, Director-General of I.A.T.A.

September 17th to 20th: Committee Reports: Financial, by R. Lorimer Weir, B.E.A.; Legal, by W. A. Steenstra-Toussaint, K.L.M.; Technical, by Capt. A. V. J. Vernieuwe, Sabena; Traffic Advisory, by Keith Granville, B.O.A.C.; Facilitation, by John A. Paine, P.A.W.A.

September 21st: Public Closing Session, 10:30 a.m.
Formal resolutions for final consideration and vote.
Election of new President to take office at the 1957 Annual General Meeting.
Choice of 1957 meeting place.

Entertainment and Social activities:

September 17th: The Scottish flavour of the Meeting will be set at the opening by the bag-pipers of the Edinburgh City Police Band.
In the evening, delegates will be received by the Secretary of State for Scotland, the Rt. Hon. James Stuart, in the Banqueting Hall of Edinburgh Castle. After a buffet supper, they will see the historic "Beating of Retreat" by the Castle Garrison, at which Marshal of the Royal Air Force Lord Douglas will take the salute.

September 18th: Civic reception in the City Chambers by the Rt. Hon. Sir Kohn G. Banks, Lord Provost of Edinburgh, the Magistrates and Councillors of the City of Edinburgh.

September 19th: Excursion from Gourock round the Kyles of Bute and the Firth of the Clyde.

September 20th: Annual I.A.T.A. "family party"—a dinner-dance offered by the host airlines at Hopetoun House, South Queensbury. Delegates will be invited to try Scottish country dances, after demonstrations by a team from the Royal Scottish Country Dance Society.

A special programme has been arranged for the more than 100 wives and daughters of delegates who are expected to attend the Meeting. They will have a chance on their own to see ... Scottish fashions, house furnishings and handicrafts and to visit points of interest around Edinburgh.

become extremely technical and could at times prove totally misleading to the uninitiated spectator. One cannot, unfortunately, publish an official running commentary because many of the problems are interlocking and it would be impossible to make announcements about one while the others still remained to be settled.

Conferences, too, are not held in the same formal manner as some other international meetings. The delegates are practical people who believe more in results than in protocol, and informal discussions frequently involving revision and alteration to effective agreements go on until the very last stages. By avoiding any public statements until the Conference is concluded, discussions can be kept on a friendly and constructive basis without carriers feeling that they must play to a critical gallery.

There are usually, too, a few slightly edged comments about the places where the Conferences are held. Names like Cannes, Miami and Honolulu seem to give some people (with perhaps an envious turn of mind) a picture of simulated ease. Many of us wish that this was the situation in practice, but I am afraid that it is far from being the case. The governing factor in choosing Conference locations is of course space, and space means big hotels. This almost automatically implies holiday resorts out of season where the hotels can provide the large amount of accommodation needed at times when the prices are attractive. Furthermore, if the individuals representing the airlines are going to have to work about 12 hours a day—and that is about the average figure for Cannes—there must indeed be facilities for getting quick meals and, no less important, some amenities for exercise.

When of course the public sees the results of the Conference, there is a good deal of comment on the final results achieved. An analysis of this, however, shows that much of it is directed less at Conference procedure itself than at what some people think are shortcomings on the part of the airlines in not meeting everyone's wishes. Such comment is of course completely understandable, as each section of the community is naturally anxious to see provision made for its own particular requirements.

However, there is one somewhat extreme attitude which seems to think that, because the air transport industry is now a big one, it ought automatically to provide cheaper rates for those people who cannot afford to pay more. In other words, it ought to act as a kind of social service for the benefit of the community at large. Needless to say, even on a national basis, this is plain bad economics and happens to be quite impractical if applied in the international field.

The airlines are neither blind nor complacent, but quite sensibly they must always keep at the back of their minds the ultimate economic results, regardless of whether their shareholders are private investors or just taxpayers. It is usually at this stage that someone who is dissatisfied with the results of the Conference puts forward the suggestion that governments should defend the interest of their own nationals and should play a greater part in fixing fares and rates. But let us be quite clear on this point. No single government can dictate international fares and rates, so that if governments are to play a greater part, they could in fact only do so if they did it jointly. Judging by the normal speed of intergovernmental negotiations, it would take approximately three years to establish any world-wide system of rates and fares, and even then, because these would be fixed by people who were not in direct contact with the needs and requirements of the customer, they would probably bear little relation to the real requirements of the world. The rating structure would in all probability tend more to reflect political thought than intelligent transport practice.

As I mentioned at the beginning of this article, it was not my intention to refute categorically all the criticisms which have been made about I.A.T.A. Conference procedure, but only to explain some of the points which I have heard most frequently in connection with the last meeting at Cannes. There is indeed one significant fact—no one has yet suggested any method for establishing fares and rates which does not suffer from infinitely greater objections than the present Conference system. No piece of machinery is ever perfect, and the member airlines of I.A.T.A. are well aware of this fact. For this reason Conference procedure is kept under constant review to make sure that it fits as closely as possible the purposes for which it was originally devised.

14 15 16 17 18 19 20 21

14. Iberia: Don César Gómez Lucia, General Manager; 15. K.L.M.: I. A. Aler, President; 16. L.A.I.: Prince Marcantonio Pacelli, President; 17. L.A.I.: Gen. Luigi Gallo, Gen Manager; 18. Sabena: Gilbert Périer, Chairman; 19. Sabena: Willem Deswarte, General Manager; 20. S.A.S.: H. Throne-Holst, President; 21. Swissair: Dr. Rudolf Heberlein, Chairm

Continued page

Sky Styles

Twenty-nine airline companies from sixteen countries took part in an "Air Fashion Show" at New York's swank Hotel Pierre earlier this year to demonstrate the stylishness and the comfort of their—air hostesses' uniforms. Participants in the show were working hostesses who happened to stop in New York on their regular flights, with the exception of the Japan Air Lines hostesses who were specially invited.

Airlines have long realized the importance of giving the passenger a good first impression when he boards an aircraft. It is up to the hostess to convey this impression, and her most important aid—besides the proverbial "pleasing personality"—is a good-looking, well-designed uniform and its accessories.

Unless we are mistaken, the air hostess is an American invention, and U.S. airlines go to

Collection of airline pulchritude at the Air Fashion Show at New York's Hotel Pierre earlier this year. Clockwise: Kiyoko [illegible], Japan Air Lines; Milagros, Iberia, Spain; Reiko Takedo, Japan Air Lines; [illegible]nette Mary Ramallo, L.A.V., Venezuela; Annemarie Ter Haar, K.L.M., Holland; Francesca Romana, L.A.I., Italy; Janet Nordquist, S.A.S., Scandinavia; Judy Manning, U.A.L., U.S.A.; Lydia Tanves, Sabena, Belgium; Ruth Wallefeld, D.L.H., W. Germany.

Miss Muffett Webb, Braniff Airways, was elected "Miss Skyways of the United States".

"The most chic, typically French and symbolic of their couturiers" was the description applied to the uniform of Air France, here worn by air hostess Jacqueline Franche.

B.O.A.C. stewardess Ann Price, who last year won the international "Queen of the Air" contest in Johannesburg, South Africa.

Linee Aeree Italiana hostess, name unknown (unfortunately). "Raglan sleeves, built-in pettiskirt", etc. . . .

Japan Air Lines: two hostesses (names unknown, unfortunately), one of whom wears the meal-time kimono.

Mohawk Airlines hostess (name unknown, etc.).

American Airlines hostess Dorothy Baker.

United Air Lines hostess (name unknown, etc.)

Eastern Air Lines hostess Claire Tarleton.

Colonial Airlines summer uniform (name of contents unknown, unfortunately).

Hostesses through the ages . . . Twenty-five years of United Air Lines uniforms.

extraordinary lengths to train smart, good-looking cabin attendants. Yet, the organizers of the New York Air Fashion Show are fair enough to admit that "many of the airlines, especially the foreign airlines, displayed new types of uniforms, not only unusual in design but also affording greater working comfort."

It would be difficult for *Interavia* Review to produce a detailed description of these new uniforms, because the Editors are more familiar with aviation terminology than with fashion jargon. And readers would probably be puzzled by such terms as "skirts with built-in panels or petti-skirts...light-weight Egrathea...Skipper Blue Stillwater sheen gaberdine...knife-pressed eight-gore skirts...kick pleats and ARMO construction for figure flattery..." However, the uniforms are pleasant to look at... and so are their contents, some of which are depicted here.

The organizers of the Air Fashion Show report that the event was a vast success and that many New York fashion designers are studying hostess uniforms for designs for their own customers. What is more, the organizers have decided to make the display an annual event.

Here comes America's first jet transport-tanker

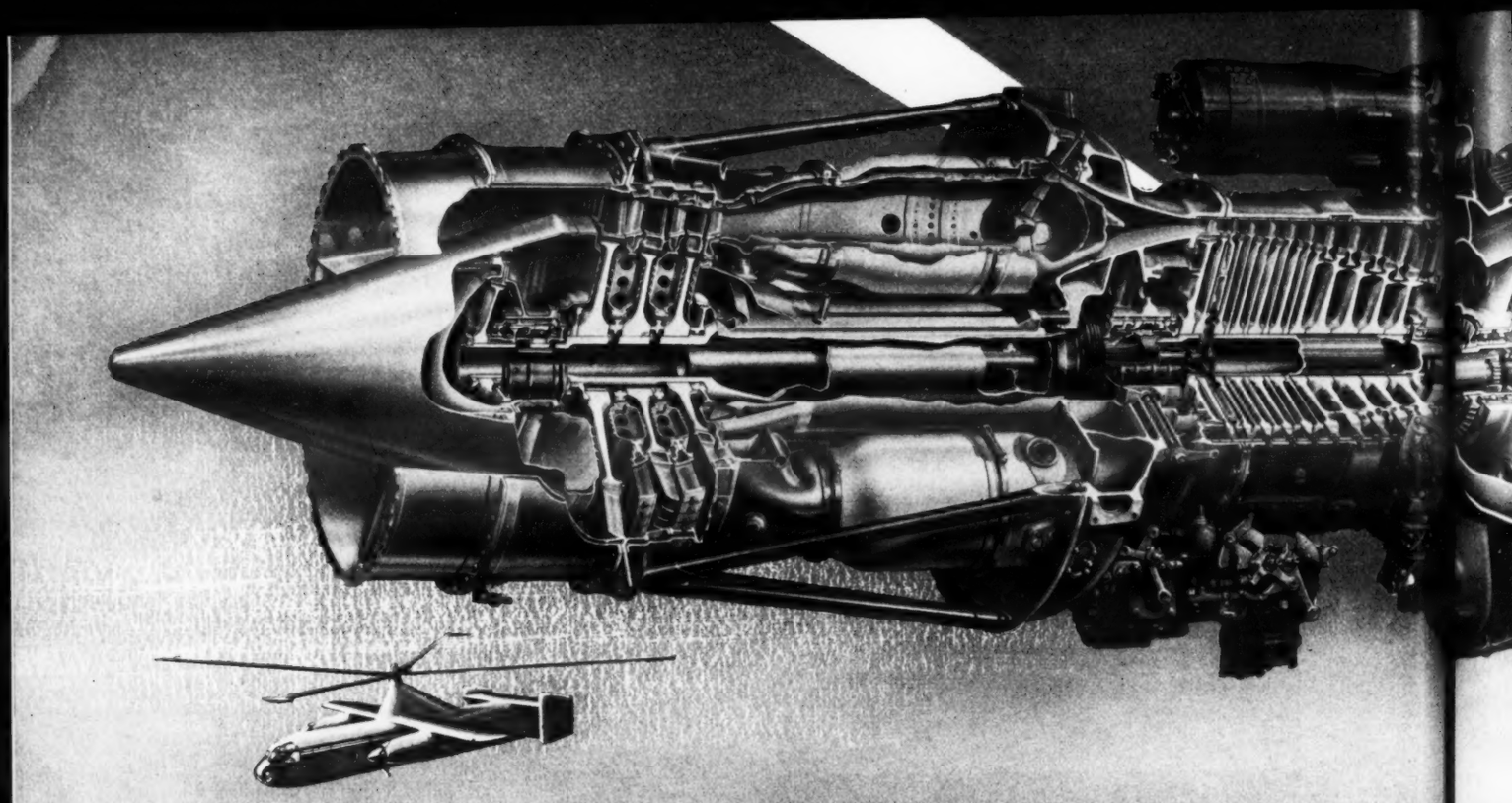
Rolling majestically off one of the production lines at Boeing's Transport Division plant is the nation's first jet transport-tanker, the KC-135.

This revolutionary new type of aircraft gives the Air Force a tanker that matches the performance of today's jet-age bombers and fighters, enabling them to refuel at the speeds and altitudes at which they operate most efficiently. The KC-135 is also the first transport geared to the defense demands of the jet age.

As the first KC-135 rolled out into the sun, the 888th KC-97—last of Boeing's piston-driven airplanes—came off another line in the same plant. Thus, during its 40th anniversary year, Boeing leaves behind the age of piston-powered aviation. The company, a pioneer in jet-flight development, is now devoting its facilities to building jet aircraft exclusively. In addition to the KC-135, its jet production includes the 707 commercial transport, the eight-jet B-52 and the six-jet B-47 bombers.

Although the first of its kind, the KC-135 is a proven aircraft, backed by over two years of intensive flight testing of a prototype model. It incorporates refinements that could grow only out of actual flight testing. In addition, Boeing's unique experience with a prototype model helped cut production time on the first KC-135 by 20%. The first jet transport-tanker comes logically from Boeing. For this company has designed and built more large, multi-jet aircraft than any other organization in the world, and pioneered and developed aerial refueling. The new KC-135 takes its place in the line of illustrious Boeing aircraft which have, over the past four decades, helped America initiate new eras in both commercial and military aviation.

BOEING



It's Stands C & 125 for **NAPIER**

ELAND. Every medium-haul airline in the world is faced with an urgent decision: how, and how soon, to convert to turbo-props in the 3,000 – 4,000 e.h.p. range. The immediate and simple answer is the ELAND—single-spool, inherently safe and fundamentally economical. The *Napier Eland Convair* is a convincing illustration. It shows (1) the speed and cheapness of ELAND conversion (2) the greatly improved performance figures which result—12,880 lbs maximum payload carried 1,220 miles instead of 290 miles, 50 m.p.h. faster cruising speed—giving a greatly increased profit margin. Faster, smoother, quieter—the ELAND offers medium-haul airliners a new lease of life.

Fairey's new large transport helicopter, the Rotodyne, is to be powered in both vertical and forward flight by two ELANDS—basically similar to the standard ELAND but with an auxiliary compressor mounted co-axially at the rear.

GAZELLE. 1,260 – 2,000 s.h.p. free turbine engine for helicopters—chosen for the Royal Navy Westland S.58 "Wessex" and the R.A.F. twin-rotor Bristol 192. For ease of installation it can be mounted in any position between the vertical and horizontal. Helicopters demand tough, reliable engines: the Gazelle is designed for strenuous duty and long service between overhauls, while its outstanding simplicity means economical and speedy maintenance.

RAMJET & ROCKET ENGINES. At extreme altitudes Napier rocket engines provide the rapid acceleration, increased rate of climb and improved manoeuvrability essential for high-flying interception. Operating on liquid propellants these engines are simple, robust, high performance power units capable of repeated start-stop sequences at any altitude with complete reliability. A Napier-built ramjet test vehicle holds the British height record for such vehicles.

ORYX. The turbo-gas generator for helicopter rotor tip propulsion type tested at 780 g.h.p. and 865 g.h.p.

SPRAYMAT electrical de-icing system can be sprayed on to any contour—no matter how complex. To date Spraymat has flown well over 30 million miles in operational service.

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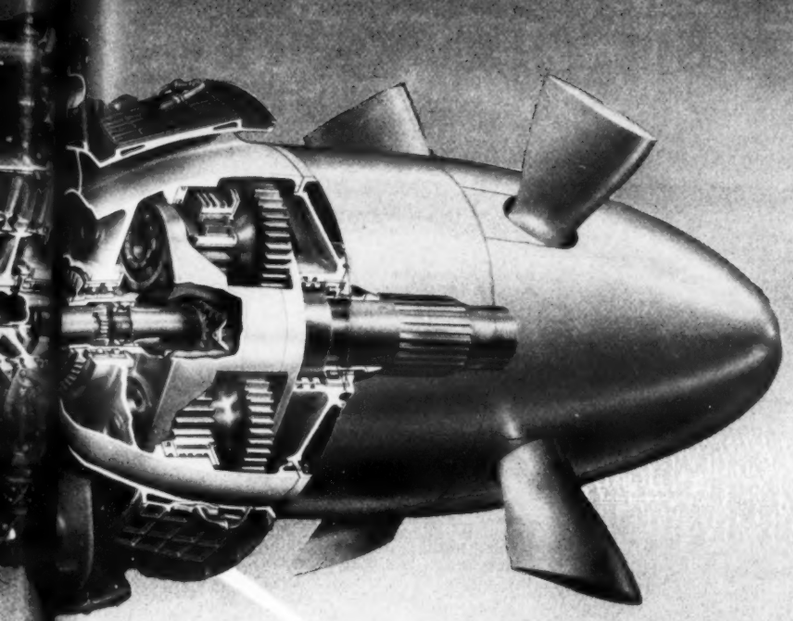
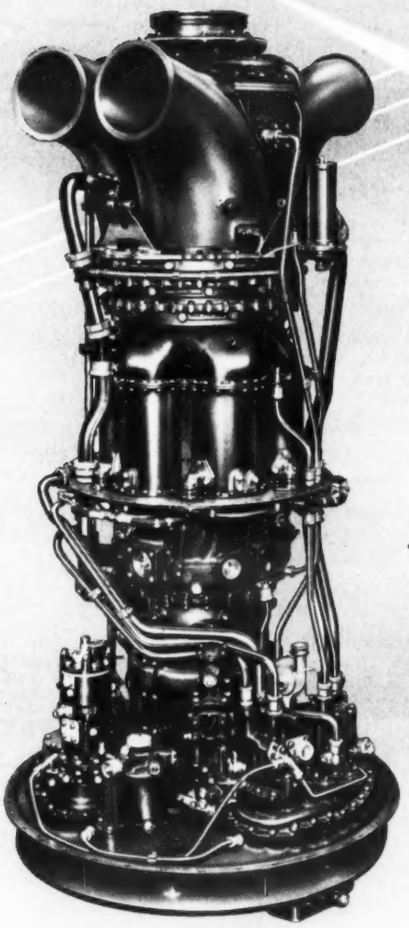


Eland turbo-prop



Gazelle free turbine engine

Ramjet & Rocket engines

PILLARS OF WORLD AIR TRANSPORT

A "Who's Who" of the International Air Transport Association

(see INTERAVIA : No. 9/1949, 8-9/1950, 9/1951, 10/1953)

CAPITAL or OWNERSHIP	MANAGEMENT	AIR FLEET *Available*	AIR FLEET *On Order*	PRINCIPAL ROUTES	R: Route Mileage (unduplicated) E: Employees
EUROPE					
AER LINGUS TEORANTA, 43, Upper O'Connell Street, Dublin, Ireland.					
Authorized: £5,000,000 Issued: £952,000	P. Lynch, Chairman J. F. Dempsey, General Manager Capt. J. C. Kelly-Rogers, Deputy General Manager P. J. Brennan, Commercial Manager Capt. W. J. Scott, Operations Manager	4 Viscount 700 13 Douglas DC-3 17	3 Viscount 800 5 Fokker F.27 Friendship 8	Dublin to 17 points in Europe and the British Isles.	R: 3,970 E: 1,770
AIR FRANCE, Compagnie Nationale Air France, 2, rue Marbeuf, Paris 8e.					
Fr. frs. 10,000,000,000	Max Hymans, Chairman Louis Lesieux, Director-General René Briend, Hon. Dir.-General Raymond Dupré, Dep. Dir.-General (Engineering) Robert Montarnal, Dep. Dir.-General (Economic Affairs) Michel Henry de Villeneuve, Commercial Director Emile Delclaux, Director of Finance P. Fromheim, Operations Director A. Vivier, Director of Equipment	19 Lockheed L-1049C and G 17 Lockheed L-749 20 Douglas DC-4 40 Douglas DC-3 12 Vickers Viscount 708 12 Breguet Provence BR763 120	4 Lockheed L-1049G 10 Lockheed L-1649A 10 Boeing 707-320 jets (plus 8 on option) 12 SE.210 Caravelle jets (plus 12 on option) 36 (plus 20 on option)	Paris to 36 points in Europe, 150 points in Africa, 22 points in the Americas, 13 points in Asia	R: 170,500 E: 17,500
• **AIRWORK LIMITED,** Airwork House, 35, Piccadilly, London W.1					
Private	M. D. N. Wyatt, Chairman and Man. Dir. L. A. Lafone, General Manager Technical L. R. E. Castlemaine, Sales Manager G. E. Ford, Operations Manager K. R. Sangster, Traffic Manager	4 H.P. Hermes 7 Vikings 3 Douglas Dakotas 14 plus numerous other smaller aircraft		To points in East, West and Central Africa	R: 44,800 E: 2,350
ALITALIA, AEROLINEE ITALIANE INTERNAZIONALI, 20, Via L. Bissolati, Rome.					
Lire 4,500,000,000	Count Dr. Nicolo Carandini, Chairman Lord Douglas of Kirtleside, Vice Chairman Dr. Ing. Bruno Velani, Director-General Renato Cappelletti, Commercial Director Dr. Ing. Giuseppe Rimer, Director of Equipment	6 Douglas DC-6B 4 Convair 340 10	2 Convair 440 Metropolitan 4 Douglas DC-7C Seven Seas 6	Domestic; points in Europe; Near East; South America; South Africa	R: 31,500 E: 950
AVIACO, AVIACION Y COMERCIO, S.A., Aduana 33, Madrid.					
Ptas. 100,000,000	José Pazo Montes, Chairman and Director-General José Inchausti Balseiro, Administration and Commercial Director Emilio O'Connor Valdivielso, Director of Traffic Julio Nadal Aixala, Chief Engineer	6 Bristol 170 5 S.E.161 Languedoc 11		Mainly domestic; points in North Africa and France	R: 6,500 E: 500
B.E.A., BRITISH EUROPEAN AIRWAYS CORPORATION, Keyline House, South Ruislip, Middlesex.					
Issued: £ 16,000,000	Marshal of the Royal Air Force Lord Douglas of Kirtleside, Chairman Sir John Keeling, Deputy Chairman Anthony H. Milward, Chief Executive	27 V. 701 Viscount 19 D.H. Elizabethan 38 Douglas DC-3 8 Douglas C-47 3 D.H. 89A Rapide 3 3 D.H. 114 Heron IB 6 Helicopters 3 Westland Sikorsky W.S. 55 2 Bristol 171 Mk.3A 1 Bell 47B3 104	24 V.802 Viscount 14 V.806 Viscount 20 V.951 Vanguard 58	International, to 43 points in Europe and Near East; domestic, to 22 points	R: 25,400 E: 9,100
B.O.A.C., BRITISH OVERSEAS AIRWAYS CORPORATION, London Airport, Hounslow, Middlesex.					
£46,748,354	Gerard d'Erlanger, Chairman Sir George Cribbett, Deputy Chairman Basil Smallpeice, Managing Director Major J. R. McCrindle, Adviser, International Affairs C. Abell, Chief Engineer Keith Granville, Commercial Director	16 Lockheed Constellation 749A 16 Boeing Stratocruiser 20 Canadair Argonaut 6 Bristol Britannia 4 Avro York Freighters 62	27 Bristol Britannia 19 D.H. Comet IV 10 Douglas DC-7C 56	To 5 points in Europe; 11 in Africa; 12 in North America; 23 in Asia; 2 in Australasia	R: 84,400 E: 18,550
C.S.A., CESKOSLOVENSKE AEROLINIE, 8 Namesti Republiky, Prague and Prague-Ruzyne Airport.					
State	Josef Procházka, Director General Alois Palichled, Dep. Dir. Gen. (Traffic and Operations) Jaroslev Kracek, Dep. Dir. Gen. (Chief Engr.) Vratislav Drabek, Dep. Dir. Gen. (Finance and Adm.)	Ilyushin Il-12 Douglas DC-3 Li-2		Paris, Copenhagen, Helsinki; points in Eastern Europe, including Moscow	R: 5,900 E: n. a.
DEUTSCHE LUFTHANSA AKTIENGESELLSCHAFT, Claudiusstrasse 1, Cologne					
DM. 80,000,000	Hans M. Bongers, Commercial Director Gerhard Höltje, Technical Director Friedrich Carl Hollmann, Traffic Manager Bernd Barg, Sales Manager Gustav Adolf Wachsmuth, Flight Operations Manager Joachim Alpheis, Maintenance Manager	8 Lockheed L-1049G 4 Convair 340 3 DC-3 2 Saab Safir 17	4 Lockheed L-1649A 7 V.810 Viscount 2 Convair 440 4 Boeing 707-320 jets 17	Points in Europe; North Atlantic to New York and Chicago ; South America	R: 8,000 E: 3,035
FINNAIR, AERO O/Y, 9B Mannerheimintie, Helsinki					
Fin. Mk. 60,000,000	Lt.-General Leonard Grandell, President Bertel Aulin, Vice-President (Technical) Adolf Nyström, Vice-President (Commercial)	3 Convair 340 1 Convair 440 10 Douglas DC-3 14	1 Convair 440	Domestic; Europe, including Moscow	R: 9,850 E: 1,000
FLUGFELAG ISLANDS, H.F. (ICELAND AIRWAYS LTD.), Reykjavik Airport, P.O.Box 955, Reykjavik					
Kr. 3,053,000	G. Vilhjalmsson, Chairman O. O. Johnson, General Manager S. K. Matthiasson, Traffic Manager (Int.) H. Sigurdsson, Traffic Manager (Dom.)	2 Douglas DC-4 4 Douglas DC-3 2 PBY-5A Catalina 1 Grumman Goose 9		Reykjavik to U.K., Scandinavia and Germany; domestic	R: 8,370 E: 210
H.C.A., HUNTING-CLAN AIR TRANSPORT LIMITED, London Airport, Hounslow, Middlesex.					
Hunting-Clan Air Holdings Ltd.	M. H. Curtis, Managing Director Captain L. B. Greensted, Technical Manager D. J. Platt, Commercial Manager John Robinson, Sales Manager	3 Vickers Viscount 9 Vickers Viking 4 Douglas DC-3 4 Avro York 20	2 Vickers Viscount	To East, West and Central Africa; points in Europe; Gibraltar; domestic	R: 22,000 E: 480
IBERIA, C.M.A., LINEAS AÉREAS ESPAÑOLAS, Avenida America No. 2, Madrid.					
Ptas. 90,000,000	Tomas Delgado, President Cesar Gomez Lucia, General Manager J. M. Ansaldo, Operations Manager Eduardo Mira, Financial Manager Juan B. Viniegra, Secretary General	3 Lockheed L-1049E 6 Douglas DC-4 17 Douglas DC-3 4 Bristol 170 30	2 Lockheed L-1049G 5 Convair 440 7	To New York; points in Latin America; Africa; Europe; domestic	R: 45,800 E: 2,470
J.A.T. — JUGOSLOVENSKI AEROTRANSPORT (YUGOSLAV AIR LINES), Birčaninova 1/III, Belgrade.					
Din. 1,800,000,000	Milan Simovic, Director General Aleksander Badanjak, Commercial Director Radomir Zivanovic, Financial Director Ing. Radmilo Radojkovic, Technical Director Vojislav Rakic, Operations Director	13 Douglas DC-3 3 Convair 340 16	1 Convair 440	To seven countries in Europe; Turkey and Egypt; domestic	R: 8,000 E: 719

K.L.M. — ROYAL DUTCH AIRLINES (Koninklijke Luchtvaart Maatschappij N.V.), 1 Plesmanweg, The Hague.

Fl. 123,000,000	I. A. Aler, President F. von Balluseck, Exec. Vice-President (Traffic) M. J. van der Ploeg, Exec. Vice-President (Finance and Administration) Ir. F. Besançon, Exec. Vice-President (Production) Dr. H. L. Slotemaker, Exec. Vice-President (Air Policy) Dr. J. v. d. Wiel, Exec. Vice-President (Secretary-General)	14 Convair 340 7 Convair 240 10 Lockheed L-1049G 8 Lockheed L-1049E 10 Lockheed L-749A 8 Douglas DC-6A/B 6 Douglas DC-6 6 Douglas DC-4 15 Douglas DC-3 84	10 Douglas DC-7C 8 Douglas DC-8 jets 12 Lockheed L-188A Electra 8 Vickers V-803 Viscount 2 Fokker F.27 Friendship 41	European; Far East and Australia; U.S.A., Canada and Mexico; South America; Dutch West Indies; South Africa	R: 151,000 E: 15,000

L.A.I., LINEE AEREE ITALIANE S.p.A., 132, Via del Tritone, Rome.

Lire 5,000,000,000	Prince Avv. Marcantonio Pacelli, President Comm. Richard Mazzarini, Vice-President General Luigi Gallo, General Manager Cdt. Antonio Nervi, Administrative Manager Dr. Ricardo Naselli, Commercial Manager	3 Douglas DC-6B 3 Douglas DC-6 13 Douglas DC-3 4 Convair 240 23	6 V.770D Viscount (plus 2 V.770D and 4 V.880 on option) 4 Lockheed L-1649A (plus 6 on option) 10 (plus 12 on option)	Connects 25 major Italian towns to points in Europe, Near East, North Africa, North America.	R: 25,000 E: 1,400

LOT, POLSKIE LINIE LOTNICZE (Lignes Aériennes Polonaises « Lot »), 39 Hoza, Warsaw.

State	Andrzej Skala, Director-General Ing. W. Leja, Technical Director M. Rolski, Commercial Director M. Grabowski, Operations Director	Ilyushin Il-14 Ilyushin Il-12 Li-2 Douglas DC-3 Aero 45		To points in Western and Eastern Europe, including Moscow	R: 7,000 E: n.a.

SABENA, SOCIÉTÉ ANONYME BELGE D'EXPLOITATION DE LA NAVIGATION AÉRIENNE, 35, rue Cardinal Mercier, Brussels.

Belg. frs. 500,000,000	Gilbert Périer, Chairman Gaston Claeys, Managing Director Willem Deswarte, General Manager Gaston Dieu, Dep. General Manager Fernand De Ridder, Technical Adviser René Golstein, Secretary-General Félicien Pirson, Technical Manager Anselme Vernieuwe, Operations Manager	4 Douglas DC-6 8 Douglas DC-6B 2 Douglas DC-6A 9 Douglas DC-4 16 Douglas DC-3 2 Douglas C-49 Dakotas 10 Douglas C-47 Dakotas 2 Convair 440 5 Convair 240 4 Sikorsky S.55 6 D.H. 82 7 Saab Safir 1 Auster 2 Piper 78	9 Douglas DC-7C 4 Boeing 707 jets 10 Convair 440 8 Sikorsky S.58 31	Points in Europe and Mediterranean, North Atlantic; Belgian Congo and South Africa; domestic in Belgian Congo	R: 45,000 E: 6,500

S.A.S., SCANDINAVIAN AIRLINES SYSTEM, Stockholm 40.

Swed. Kr. 157,500,000	Henning Throne-Holst, President Sven Ostling, Executive Vice-President Viggo J. Rasmussen, Executive Vice-President Thore Boye, Executive Vice-President Nils Langhelle, Executive Vice President	14 Douglas DC-6B 12 Douglas DC-6 4 Douglas DC-4 10 Douglas DC-3 13 Convair 440 8 Saab Scandia 1 Junkers Ju 52 62	14 Douglas DC-7C 7 Douglas DC-8 jets 3 Convair 440 24	Points in Europe, North Atlantic, South Atlantic, Polar Route Europe-Greenland-U.S. West Coast; Middle and Near East	R: 99,450 E: 8,400

SWISSAIR, SOCIÉTÉ ANONYME SUISSE POUR LA NAVIGATION AÉRIENNE, Hirschengraben 84, Zurich.

Sw. Fr. 42,000,000	Dr. Rudolf Heberlein, Chairman Dr. Walter Berchtold, Managing Director Dr. Heinz Haas, Secretary-General Eugen Groh, Director of Finance Lucien L. Ambord, Director of Traffic and Sales Robert Fretz, Director of Operations Isidor Lack, Director of Engineering	6 Douglas DC-6B 3 Douglas DC-4 9 Douglas DC-3 7 Convair 240 25	4 Douglas DC-7C 2 Douglas DC-8 jets 11 Convair 440 17	Points in Europe, North America, South America, Near East	R: 25,000 E: 3,576

T.A.E. NATIONAL GREEK AIRLINES (Technical & Aeronautical Exploitations Co., Ltd.), 12, Merlin Street, Athens.

Onassis Shipping Interests	N. Averoff, Chairman and Chief Executive N. Voyatzis, Vice Chairman	1 Douglas DC-4 14 Douglas DC-3 15	*To be ordered:* 2 Douglas DC-7C 6 Viscounts 8	Middle East, Italy, France, U.K.; domestic	R: 6,350 E: 850

T.A.I., COMPAGNIE DE TRANSPORTS AÉRIENS INTERCONTINENTAUX, 23, rue de l'Amiral-d'Estaing, Paris 16e.

Fr. frs. 656,000,000	Paul Bernard, Chairman General Georges Fayet, Director-General J. J. Wilmot Roussel, Dep. Director-General J. Mathieu, Secretary-General Colonel L. Aubree, Operations Director A. Gaffie, Commercial Director	4 Douglas DC-6B 2 Douglas DC-4 3 Douglas DC-3 9	3 Douglas DC-7C	To points in North Africa and French African Colonies; Far East; Australia and New Caledonia	R: 25,000 E: 800

T.A.P., TRANSPORTES AÉREOS PORTUGUESES, S.A.R.L., Rua Braamcamp, No. 2, Lisbon, Portugal.

Esc. 120,000,000	Eng. D. Francisco de Mello e Castro, Chairman Dr. Ernesto Coelho, Secretary-General Henrique da Costa Pessoa, Commercial Manager Roger de Avelar, Operations Superintendent Eng. Jorge Carregal Ferreira, Maintenance Superintendent	3 Lockheed L-1049G 3 Douglas DC-4 6 Douglas DC-3 12		To Portuguese African Colonies; points in Europe and North Africa	R: 8,750 E: 760

U.A.T., UNION AÉROMARITIME DE TRANSPORT, 5, boulevard Malesherbes, Paris 8e.

Fr. frs. 51,000,000	Louis Vidal, Chairman and Managing Director J. Combard, Director R. Loubry, Director A. Veillard, Deputy Director J. P. Villaceque, Deputy Director	7 Douglas DC-6 1 Douglas DC-4 4 Nord 2501 8 D.H. Heron 20		Points in French West Africa, French Equatorial Africa, South Africa	R: 16,000 E: 1,350

U.S.A. AND CANADA

AMERICAN AIRLINES, INC., 100 Park Avenue, New York City, New York.

$146,872,000, including credits and debentures	C. R. Smith, President W. J. Hogan, Senior Vice President, Finance C. W. Jacob, Senior Vice President and Secretary O. M. Mosier, Senior Vice President, Operations C. R. Speers, Senior Vice President, Sales	40 Douglas DC-7 75 Douglas DC-6 type 7 Douglas DC-6A 74 Convair 240 4 Miscellaneous 200	22 Douglas DC-6 and DC-7 type 35 Lockheed Electra 30 Boeing 707 jets 87	U.S. transcontinental to 77 cities in the United States, Canada and Mexico	R: 14,505 E: 20,000

BRANIFF INTERNATIONAL AIRWAYS INC., Love Field, Dallas 9, Texas.

$23,479,180, capital and surplus	Charles E. Beard, President J. W. Miller, Exec. Vice President C. G. Adams, Vice President (Finance) and Secretary Rex K. Brack, Vice President (Traffic and Sales) R. V. Carleton, Vice President (Operations)	9 Douglas DC-6 22 Douglas DC-3 1 Douglas C-47 2 Lockheed L-749 25 Convair 340 2 Curtiss C-46 61	7 Douglas DC-7C 5 Boeing 707 jets 9 Lockheed Electra 5 Convair 440 26	Points in the Central U.S.A.; West Coast services to South America	R: 16,420 E: 4,430

COLONIAL AIRLINES INC. — merged with Eastern Air Lines earlier this year.

C.P.A.L., CANADIAN PACIFIC AIR LINES LIMITED, Vancouver Airport, B.C.

Wholly-owned subsidiary of Canadian Pacific Railway Co.	G. W. G. McConachie, President R. W. Ryan, Executive Vice President R. B. Phillips, Vice President, Operations H. B. Renwick, Vice President, Traffic	6 Douglas DC-6B 1 Douglas DC-4 14 Douglas DC-3 5 Convair 240 8 Curtiss C-46F 2 D.H. Otter 2 Convair Canso 38	6 Douglas DC-6B 5 Britannia 314 11	To Far East, Australia, South America, Europe; domestic	R: 41,300 E: 1,800

DELTA AIR LINES INC., Atlanta Airport, Atlanta, Ga.

$28,357,000	R. W. Freeman, Chairman C. W. Woolman, President and Gen. Mgr. Laigh C. Parker, Vice President (Traffic and Sales) Charles H. Dolson, Vice President (Operations) T. G. Cole, Vice President (Finance)	11 Douglas DC-7 7 Douglas DC-6 16 Douglas DC-3 20 Convair 340 4 Lockheed Constellation 58	10 Douglas DC-7 6 Douglas DC-8 jets 8 Convair 440 10 Convair 880 jets 34	U.S. domestic, Chicago to Dallas, New Orleans, Miami; New Orleans to Cuba, Puerto Rico, Venezuela	R: 10,765 E: 5,200

*** E.A.L., EASTERN AIR LINES, INC.**, Eastern Air Lines Building, 10 Rockefeller Plaza, New York 20, New York.

Nom. Auth. $5,000,000 Recently merged with Colonial Airlines	E. V. Rickenbacker, Chairman Thomas F. Armstrong, President Paul H. Brattain, First Vice President Sidney L. Shannon, Senior Vice President (Operations) M. M. Frost, Vice President (Traffic & Sales)	16 Lockheed L-1049C 13 Lockheed L-1049A 18 Lockheed L-749 12 Douglas DC-7B 1 Douglas DC-4 60 Martin 4-O-4 120 From Colonial Airlines: 5 Douglas DC-4 8 Douglas DC-3 13	10 Lockheed 1049G 40 Lockheed Electra 28 Douglas DC-7B 20 Douglas DC-8 jets 15 Convair 440 113	Domestic, mostly North-South in Eastern U.S.A.; seeking Mexico City route	R: 7,500 E: 11,000

NATIONAL AIRLINES, INC., 3240 N.W. 27th Ave., Miami 42, Florida.

Auth: 1,600,000 Shares Issued: 1,037,952 Shares	G. T. Baker, President and Chairman J. C. Brawner, Senior Vice President and Treasurer C. E. Banks, Vice President-Production R. E. Wieland, Vice President L. W. Dymond, Assistant Vice President-Operations W. A. Perry, Assistant Vice President & General Sales Manager	4 Douglas DC-7 8 Douglas DC-6B 4 Douglas DC-6 12 Convair 340 6 Convair 440 11 Lockheed Lodestars 45	4 Douglas DC-7B 6 Douglas DC-8 jets 23 Lockheed Electra 33	U.S. East Coast from Miami; to Cuba	R: 2,829 E: 3,000

*** N.Y.A., NEW YORK AIRWAYS, INC.**, P.O. Box 426, LaGuardia Airport, Flushing 71, New York.

$2,432,279	John L. Senior, Jr., Chairman Robert L. Cummings, Jr., President Horace Brock, Vice President	3 Sikorsky S-58 5 Sikorsky S-55 8	5 Sikorsky S-58	Helicopter feeder services in New York area	R: Abt. 300 E: 150

NORTHWEST AIRLINES, INC., 1885 University Avenue, St .Paul 4, Minnesota.

Net worth end of 1955: $28,228,484	Croil Hunter, Chairman Donald W. Nyrop, President Malcolm S. Mackay, Exec. Vice President Frank C. Judd, Vice President Operations & Engineering Gordon M. Bain, Vice President Sales	4 Lockheed 1049G 9 Boeing Stratocruiser 10 Douglas DC-6B 18 Douglas DC-4 6 Douglas DC-3 47	7 Douglas DC-6B 8 Douglas DC-7C 15	New York and Washington, D.C., to Seattle; to Hawaii, to Alaska and the Orient	R: 17,253 E: 5,700

P.A.A., PAN AMERICAN WORLD AIRWAYS, 135 East 42nd Street, New York 17, New York.

6,158,461 shares of $1.00 par issued	Juan T. Trippe, President John C. Leslie, Vice President (Administration) Samuel F. Pryor, Vice President and Assistant to the President Henry J. Friendly, Vice President and General Counsel Roger Lewis, Executive Vice President-Development and Defense Projects Willis G. Lipscomb, Vice President-Traffic and Sales Erwin Balluder, Vice President	26 Boeing Stratocruisers 7 Douglas DC-7B 45 Douglas DC-6B 3 Douglas DC-6A 15 Douglas DC-4 pass. 11 Douglas DC-4 cargo 5 Douglas DC-3 6 Lockheed L-49 5 Convair 240 123	23 Boeing 707 jets 25 Douglas DC-8 jets 33 Douglas DC-7C 4 Douglas DC-6 leased from Panagra 85	Exclusively U.S. overseas—trans-Atlantic, trans-Pacific, Latin America, Far East, Australasia	R: 63,155 E: 19,300

PANAGRA, PAN AMERICAN-GRACE AIRWAYS, INC., 135 East 42nd Street, New York 17, New York.

$7,500,000	Andrew B. Shea, President Douglas Campbell, Vice President & General Manager Thomas J. Kirkland, Vice President Operations Kenneth A. Lawder, Vice President & Comptroller Edward G. Bern, Vice President & Sales Manager	5 Douglas DC-7B 5 Douglas DC-6B 4 Douglas DC-6 3 Douglas DC-4 5 Douglas DC-3 22	4 Douglas DC-8 jets 1 Douglas DC-7B 5	Panama to Colombia, Ecuador, Peru, Bolivia, Chile and Argentina	R: 5,450 E: 1,400

SEABOARD AND WESTERN AIRLINES INC., 80 Broad Street, New York 4, New York.

Issued 954,000 shares: net worth $7,900,000	Raymond A. Norden, President Arthur V. Norden, Exec. Vice Pres. and Treasurer Carl D. Brell, Vice President (Operations) Wallace P. Neth, Vice President (Traffic)	5 Lockheed L-1049B 5 Douglas DC-4 10	5 Lockheed L-1049H	Scheduled Atlantic cargo services to 13 points in Europe	R: 6,430 E: 670

T.C.A., TRANS-CANADA AIR LINES, 1080 University Avenue, Montreal, Quebec.

Common stock, $5,000,000 ; Short term Loans, $13,500,000 Debentures, $20,000,000 Total $38,500,000	G. R. McGregor, President W. Gordon Wood, Vice President, Sales W. F. English, Vice President, Operations	18 Vickers Viscount 9 Lockheed L-1049 22 Canadair North Star 26 Douglas DC-3 75	4 Douglas DC-8 jets 18 Vickers Viscount 22	Transatlantic to U.K., France, Germany; to U.S.A.; Canadian trans-Continental	R: 23,700 E: 8,500

T.W.A., TRANS WORLD AIRLINES, INC., 380 Madison Avenue, New York 17, New York.

3,337,000 shares of $5.00 par issued	Warren Lee Pierson, Chairman J. A. Collings, Exec. Vice President E. O. Cocke, Senior Vice President (Sales) A. V. Leslie, Senior Vice President (Finance) Frank E. Busch, Vice President (Operations) R. W. Rummel, Vice President (Engineering)	24 Lockheed L-1049G 9 Lockheed L-1049 71 Lockheed L-49 and L-749 49 Martin 4-O-4 and 2-O-2 11 Douglas DC-4 5 Douglas DC-3 169	25 Lockheed L-1649A 4 Lockheed L-1049G 8 Boeing 707 jets 30 Convair 880 jets 67	U.S. trans-Continental, domestic; trans-Atlantic to North and South Europe; Near and Middle East	R: 35,000 E: 17,000

UNITED AIR LINES, INC., 5959 South Cicero Avenue, Chicago 38, Illinois.

Stockholders' equity $101,112,000, Long-term debt $37,012,000 Total $138,124,000	W. A. Patterson, President J. A. Herlihy, Vice President-Engineering & Maintenance D. F. Magarell, Vice President-Transportation Services Curtis Barkes, Vice President-Finance & Property R. W. Ireland, Vice President-Traffic	27 Douglas DC-7 27 Douglas DC-6B 42 Douglas DC-6 3 Douglas DC-6A 19 Douglas DC-4 13 Douglas DC-3 55 Convair 340 186	30 Douglas DC-8 jets 21 Douglas DC-7 10 Douglas DC-6B 2 Douglas DC-6A 63	U.S. trans-Continental; to West Canada and Hawaii	R: 11,250 E: 19,400

LATIN AMERICA

AEROLINEAS ARGENTINAS E.N.T., Paseo Colon 185, Buenos Aires, Argentina.

Pesos 1,000,000,000	Arturo Estebal Llavallol, President Vice Commodore Anibal Becher, Vice President Juan Carlos Mason Lugones, General Manager	6 Douglas DC-6 5 Douglas DC-4 14 Douglas DC-3 2 Douglas C-47 4 Convair 240 7 Short Sandringham 1 Beech C-45 39		Domestic; international Latin America; New York; Europe	R: 37,000 E: 5,400

AVIANCA, AEROVIAS NACIONALES DE COLOMBIA, 7a Carrera, Nos. 16-14, Bogota, Colombia.

Issued Pesos 15,000,000	Juan Guillermo Restrepo Jaramillo, President and General Manager J. A. Gonzalez Piedrahita, Exec. Vice President Juan Veros, General Manager (Traffic and Sales, International) Alberto Farios, General Manager (Traffic and Sales National)	4 Lockheed L-1049C 13 Douglas DC-4 23 Douglas DC-3 11 Douglas C-47 20 Miscellaneous 71		Domestic, Latin America, U.S.A., Europe	R: 14,570 E: 5,000

CUBANA, COMPANIA CUBANA DE AVIAÇION S.A., Aeropuerto Internacional " José Marti ", Rancho Boyeros, Havana,Cuba.

Pesos 4,105,000	José Lopez Vilaboy, President Juan M. Palli, Vice President and General Manager Oscar Bustillo, Traffic and Sales Manager Capt. Guillermo G. Biscay, Chief of Operations	2 Lockheed L-1049G 1 Lockheed L-49 3 Vickers Viscount 7 Douglas DC-3 1 Curtiss C-46 14		Domestic; to U.S.A., Mexico, Portugal, Spain	R: 10,000 E: 700

CRUZEIRO, SERVIÇOS AEREOS CRUZEIRO DO SUL, LTDA., 128 Avenida Rio Branco, P.O. Box 190, Rio de Janeiro, Brazil.

Cr. 20,000,000	Dr. J. B. R. Dantas, President J. Q. V. de Carvalho, Comm. Director Col. F. A. Rocha, Oper. Director	4 Convair 340 35 Douglas DC-3 4 Beech C-45 43		Domestic; South American international	R: 12,300 E: 3,200

GUEST AEROVIAS MEXICO S.A., 95 Paseo de la Reforma, Mexico City.

Mex. $5,000,000	Winston Guest, President G. L. Monteiro, Exec. Vice President and General Manager J. R. Joyce, Director of Traffic & Sales	Douglas DC-4 Lockheed L-749		To Panama, Miami, Windsor (Ont.)	R: 2,500 E: 300

L.A.N., LINEA AEREA NACIONAL (CHILE), Teatinos 384, Santiago de Chile.

Pesos 1,674,890,400	A. Fernandez, President A. Bermudez, Technical Manager	3 Douglas DC-6B 17 Douglas DC-3 4 Martin 2-O-2 3 Miscellaneous 27		Domestic; S. American international	R: 8,500 E: 700

L.A.V., LINEA AEROPOSTAL VENEZOLANA, Bloque 1, El Silencio, Caracas, Venezuela.

Bolivares 50,209,000	Col. Abel Romero Villate, President Jorge Roig, General Traffic Manager Capt. Miguel Torres, Technical Manager	2 Lockheed L-1049C 2 Lockheed L-749 3 Vickers Viscount 749 18 Douglas DC-3 2 Martin 2-O-2 4 Curtiss C-46 31	1 Lockheed L-1049G	Domestic; S. American international; U.S.A.; Portugal, Spain, Italy	R: 16,650 E: 1,820

P.A.B., PANAIR DO BRASIL, S.A., Santos Dumont Airport, Rio de Janeiro, Brazil.

Cr. 88,000,000	Dr. Argemiro Hungria da S. Machado, President Dr. Cesar Pires de Mello, Director-Superintendent	11 Lockheed L-749 8 Douglas DC-3 1 Convair PBY 20	4 Douglas DC-7C	To European capitals, Near East	R: 25,200 E: 3,700

VARIG, S.A., EMPRÊSA DE VIAÇAO AÉREA RIO GRANDENSE, Av. Borges de Medeiros 410-16°, P.O. Box 243, Pôrto Alegre — RGS — Brazil.

Cr. 30,000,000	Rubem M. Berta, President Oscar Siebel, Deputy Manager Goetz G. Herzfeldt, Operations Mgr. Paulo A. Dietzold, Maintenance Mgr.	3 Lockheed L-1049C 23 Douglas C-47 14 Curtiss C-46 5 Convair 240 45	2 Lockheed L-1049C	Brazilian domestic; to New York	R: 17,600 E: 3,700

AFRICA

AIR ALGÉRIE, COMPAGNIE GÉNÉRALE DE TRANSPORTS AÉRIENS, 46 Boulevard Saint-Saëns, Algiers, Algeria.

Fr. frs. 1,250,000,000	Jean Richard-Desbais, President and Director General Colonel Jacques Soufflet, Executive Director and Assistant to President M. Rey, Technical Manager M. Benard, Operations Manager M. Louis Houis, Commercial Manager	2 Lockheed L-749 5 Douglas DC-4 3 Douglas DC-3 10		Algeria to Sahara, points in France, Switzerland, Balearic Islands	R: 16,200 E: 500

C.A.A., CENTRAL AFRICAN AIRWAYS CORP., P.O. Box 1979, Belvedere Airport, Salisbury, Southern Rhodesia.

£914,000	P. J. B. Wimbush, General Manager V. H. Greager, Engineering Manager R. A. Bourlay, Oper. Manager	5 Vickers Viscount 700D 10 Vickers Viking 5 Douglas DC-3 6 D.H. Beaver 26		To London; South Africa, Kenya, Tanganyika, Port. East Africa	R: 15,000 E: 1,000

D.E.T.A., DIVISAO DE EXPLORAÇAO DOS TRANSPORTES AÉREOS, Rua Araujo, 103-2° Esq. — Lourenço Marques, Mozambique.

State	A. P. Pereira Leite, Director General Lt. Colonel A. H. Pinho da Cunha, Manager Abel Neves de Azevedo, Chief Engineer	3 Douglas DC-3 3 Lockheed Lodestar 6 D.H. Dove 4 D.H. Dragon Rapide 2 Junkers Ju 52 18		Lourenço Marques to S. Africa and adjoining areas	R: 3,000 E: 750

D.T.A., DIVISAO DOS TRANSPORTES AÉREOS, Caixa Postal 79, Luanda, Angola.

State	R. Serrao, Director-General J. de S. Medina, Manager	5 Douglas DC-3 4 Beech 18 7 D.H. Dragon Rapide 16		Port. West Africa domestic; to Belgian Congo	R: 3,300 E: 350

E.A.A.C., EAST AFRICAN AIRWAYS CORPORATION, Airways Terminal, Sadler Street, P.O. Box 1010, Nairobi, Kenya.

£221,500	Sir Alfred Vincent, Chairman Lt.-Col. M. C. P. Mostert, General Manager A. E. Robinson, Chief Inspector and Engineering Manager Captain P. A. Travers, Sales Manager	9 Douglas DC-3 4 D.H. Dragon Rapide 1 Airspeed Consul 14		East African	R: 15,575 E: 1,230

MISRAIR, EGYPTIAN AIRLINES, Almaza Airport, Heliopolis, Egypt.

£(E.)1,350,000	Air Vice Marshal Ahmad Ibrahim Abdel Razek, Chairman Abdel Salam Osman, Managing Director Air Commodore Mahmoud Sidky el Meligi, General Manager Mohamed Fouad Raafat, Deputy General Manager (Commercial) Capt. Hussein Tewfik, Deputy General Manager (Technical)	3 Vickers Viscount 7 Vickers Viking 1 Beech 18 11		To points in Europe, Africa and Near East	R: 9,950 E: 1,250

S.A.A., SOUTH AFRICAN AIRWAYS, Railway Headquarters, Johannesburg, South Africa.

£5,498,839	D. H. C. du Plessis, General Manager D. M. Robbertze, Deputy General Manager J. G. Grové, Assistant General Manager (Commercial) J. D. T. Louw, Chief Airways Manager	3 Douglas DC-7B 7 Douglas DC-4 6 Douglas DC-3 4 Lockheed L-749 20	7 Vickers Viscount 810D	Domestic; points in Africa; to European capitals	R: 26,600 E: 2,200

W.A.A.C., WEST AFRICAN AIRWAYS CORPORATION, Airways House, 161 Broad Street, Marina (P.O. Box 136), Lagos, Nigeria.

£465,000	R. W. C. Baker-Beall, Chairman D. Malcolm-Brown, General Manager A. S. M. Furniss, Deputy General Manager R. R. R. Allen, Chief Engineer	2 Bristol 170 8 D.H. Heron 5 D.H. Dove 15		Nigerian domestic; other points in West Africa	R: 7,850 E: 1,100

NEAR AND FAR EAST

AIR CEYLON LIMITED, Hemas Building, York Street, Colombo 1, Ceylon.

Authorized Rs. 15,000,000	J. L. M. Fernando, Managing Director M. Van Haselen, Deputy Managing Director Kenneth de Croos, Manager	2 Douglas DC-3 1 Lockheed L-749A 3		Domestic; Ceylon to Italy, U.K., Amsterdam, etc.	R: 13,700 E: 225

AIR-INDIA INTERNATIONAL CORPORATION, New India Assurance Building, Mahatma Gandhi Road, Fort, Bombay.

Rs. 96,680,000	J. R. D. Tata, Chairman B. R. Patel, General Manager A. C. Gazdar, Operations & Engineering Manager S. K. Kooka, Traffic Manager	3 Lockheed L-749A 6 Lockheed L-1049E and G 1 Douglas C-47 10	2 Lockheed L-1049G	Bombay to London and points in Europe; Nairobi, Singapore, Japan	R: 19,000 E: 3,500

AIR LIBAN, Place Assour, Beirut.

£(Leb.)5,000,000	Basile Meguerdiche, Director General Louis Lanata, Dep. Dir. Gen. and Technical Director J. P. Serrant, Director	2 Douglas DC-4 3 Douglas DC-3 1 S.E.160 Languedoc 3 Avro York (on lease) 9	2 Douglas DC-6B	Points in Middle East and Africa	R: 8,600 E: 321

PILLARS OF WORLD AIR TRANSPORT

A "Who's Who" of the International Air Transport Association

(see INTERAVIA : No. 9/1949, 8-9/1950, 9/1951, 10/1953)

CAPITAL or OWNERSHIP	MANAGEMENT	AIR FLEET *Available*	AIR FLEET *On Order*	PRINCIPAL ROUTES	R: Route Mileage (unduplicated) E: Employees
EUROPE					
AER LINGUS TEORANTA, 43, Upper O'Connell Street, Dublin, Ireland.					
Authorized: £5,000,000 Issued: £952,000	P. Lynch, Chairman J. F. Dempsey, General Manager Capt. J. C. Kelly-Rogers, Deputy General Manager P. J. Brennan, Commercial Manager Capt. W. J. Scott, Operations Manager	4 Viscount 700 13 Douglas DC-3 17	3 Viscount 800 5 Fokker F.27 Friendship 8	Dublin to 17 points in Europe and the British Isles.	R: 3,970 E: 1,770
AIR FRANCE, Compagnie Nationale Air France, 2, rue Marbeuf, Paris 8e.					
Fr. frs. 10,000,000,000	Max Hymans, Chairman Louis Lesieux, Director-General René Briend, Hon. Dir.-General Raymond Dupré, Dep. Dir.-General (Engineering) Robert Montarnal, Dep. Dir.-General (Economic Affairs) Michel Henry de Villeneuve, Commercial Director Emile Delclaux, Director of Finance P. Fromheim, Operations Director A. Vivier, Director of Equipment	19 Lockheed L-1049C and G 17 Lockheed L-749 20 Douglas DC-4 40 Douglas DC-3 12 Vickers Viscount 708 12 Breguet Provence BR763 120	4 Lockheed L-1049G 10 Lockheed L-1649A 10 Boeing 707-320 jets (plus 8 on option) 12 SE.210 Caravelle jets (plus 12 on option) 36 (plus 20 on option)	Paris to 36 points in Europe, 150 points in Africa, 22 points in the Americas, 13 points in Asia	R: 170,500 E: 17,500
* **AIRWORK LIMITED**, Airwork House, 35, Piccadilly, London W.1					
Private	M. D. N. Wyatt, Chairman and Man. Dir. L. A. Lafone, General Manager Technical L. R. E. Castlemaine, Sales Manager G. E. Ford, Operations Manager K. R. Sangster, Traffic Manager	4 H.P. Hermes 7 Vikings 3 Douglas Dakotas 14 plus numerous other smaller aircraft		To points in East, West and Central Africa	R: 44,800 E: 2,350
ALITALIA, AEROLINEE ITALIANE INTERNAZIONALI, 20, Via L. Bissolati, Rome.					
Lire 4,500,000,000	Count Dr. Nicolo Carandini, Chairman Lord Douglas of Kirtleside, Vice Chairman Dr. Ing. Bruno Velani, Director-General Renato Cappelletti, Commercial Director Dr. Ing. Giuseppe Rimer, Director of Equipment	6 Douglas DC-6B 4 Convair 340 10	2 Convair 440 Metropolitan 4 Douglas DC-7C Seven Seas 6	Domestic; points in Europe; Near East; South America; South Africa	R: 31,500 E: 950
AVIACO, AVIACION Y COMERCIO, S.A., Aduana 33, Madrid.					
Ptas. 100,000,000	José Pazo Montes, Chairman and Director-General José Inchausti Balseiro, Administration and Commercial Director Emilio O'Connor Valdivielso, Director of Traffic Julio Nadal Aixala, Chief Engineer	6 Bristol 170 5 S.E.161 Languedoc 11		Mainly domestic; points in North Africa and France	R: 6,500 E: 500
B.E.A., BRITISH EUROPEAN AIRWAYS CORPORATION, Keyline House, South Ruislip, Middlesex.					
Issued: £ 16,000,000	Marshal of the Royal Air Force Lord Douglas of Kirtleside, Chairman Sir John Keeling, Deputy Chairman Anthony H. Milward, Chief Executive	27 V. 701 Viscount 19 D.H. Elizabethan 38 Douglas DC-3 8 Douglas C-47 3 D.H. 89A Rapide 3 3 D.H. 114 Heron IB 6 Helicopters 3 Westland Sikorsky W.S. 55 2 Bristol 171 Mk.3A 1 Bell 47B3 104	24 V.802 Viscount 14 V.806 Viscount 20 V.951 Vanguard 58	International, to 43 points in Europe and Near East; domestic, to 22 points	R: 25,400 E: 9,100
B.O.A.C., BRITISH OVERSEAS AIRWAYS CORPORATION, London Airport, Hounslow, Middlesex.					
£46,748,354	Gerard d'Erlanger, Chairman Sir George Cribbett, Deputy Chairman Basil Smallpeice, Managing Director Major J. R. McCrindle, Adviser, International Affairs C. Abell, Chief Engineer Keith Granville, Commercial Director	16 Lockheed Constellation 749A 16 Boeing Stratocruiser 20 Canadair Argonaut 6 Bristol Britannia 4 Avro York Freighters 62	27 Bristol Britannia 19 D.H. Comet IV 10 Douglas DC-7C 56	To 5 points in Europe; 11 in Africa; 12 in North America; 23 in Asia; 2 in Australasia	R: 84,400 E: 18,550
C.S.A., CESKOSLOVENSKE AEROLINIE, 8 Namesti Republiky, Prague and Prague-Ruzyne Airport.					
State	Josef Procházka, Director General Alois Palichled, Dep. Dir. Gen. (Traffic and Operations) Jaroslev Kracek, Dep. Dir. Gen. (Chief Engr.) Vratislav Drabek, Dep. Dir. Gen. (Finance and Adm.)	Ilyushin Il-12 Douglas DC-3 Li-2		Paris, Copenhagen, Helsinki; points in Eastern Europe, including Moscow	R: 5,900 E: n. a.
DEUTSCHE LUFTHANSA AKTIENGESELLSCHAFT, Claudiusstrasse 1, Cologne					
DM. 80,000,000	Hans M. Bongers, Commercial Director Gerhard Höltje, Technical Director Friedrich Carl Hollmann, Traffic Manager Bernd Barg, Sales Manager Gustav Adolf Wachsmuth, Flight Operations Manager Joachim Alpheis, Maintenance Manager	8 Lockheed L-1049G 4 Convair 340 3 DC-3 2 Saab Safir 17	4 Lockheed L-1649A 7 V.810 Viscount 2 Convair 440 4 Boeing 707-320 jets 17	Points in Europe; North Atlantic to New York and Chicago ; South America	R: 8,000 E: 3,035
FINNAIR, AERO O/Y, 9B Mannerheimintie, Helsinki					
Fin. Mk. 60,000,000	Lt.-General Leonard Grandell, President Bertel Aulin, Vice-President (Technical) Adolf Nyström, Vice-President (Commercial)	3 Convair 340 1 Convair 440 10 Douglas DC-3 14	1 Convair 440	Domestic; Europe, including Moscow	R: 9,850 E: 1,000
FLUGFELAG ISLANDS, H.F. (ICELAND AIRWAYS LTD.), Reykjavik Airport, P.O.Box 955, Reykjavik					
Kr. 3,053,000	G. Vilhjalmsson, Chairman O. O. Johnson, General Manager S. K. Matthiasson, Traffic Manager (Int.) H. Sigurdsson, Traffic Manager (Dom.)	2 Douglas DC-4 4 Douglas DC-3 2 PBY-5A Catalina 1 Grumman Goose 9		Reykjavik to U.K., Scandinavia and Germany; domestic	R: 8,370 E: 210
H.C.A., HUNTING-CLAN AIR TRANSPORT LIMITED, London Airport, Hounslow, Middlesex.					
Hunting-Clan Air Holdings Ltd.	M. H. Curtis, Managing Director Captain L. B. Greensted, Technical Manager D. J. Platt, Commercial Manager John Robinson, Sales Manager	3 Vickers Viscount 9 Vickers Viking 4 Douglas DC-3 4 Avro York 20	2 Vickers Viscount	To East, West and Central Africa; points in Europe; Gibraltar; domestic	R: 22,000 E: 480
IBERIA, C.M.A., LINEAS AÉREAS ESPAÑOLAS, Avenida America No. 2, Madrid.					
Ptas. 90,000,000	Tomas Delgado, President Cesar Gomez Lucia, General Manager J. M. Ansaldo, Operations Manager Eduardo Mira, Financial Manager Juan B. Viniegra, Secretary General	3 Lockheed L-1049E 6 Douglas DC-4 17 Douglas DC-3 4 Bristol 170 30	2 Lockheed L-1049G 5 Convair 440 7	To New York; points in Latin America; Africa; Europe; domestic	R: 45,800 E: 2,470
J.A.T. — JUGOSLOVENSKI AEROTRANSPORT (YUGOSLAV AIR LINES), Birčaninova 1/III, Belgrade.					
Din. 1,800,000,000	Milan Simovic, Director General Aleksander Badanjak, Commercial Director Radomir Zivanovic, Financial Director Ing. Radmilo Radojkovic, Technical Director Vojislav Rakic, Operations Director	13 Douglas DC-3 3 Convair 340 16	1 Convair 440	To seven countries in Europe; Turkey and Egypt; domestic	R: 8,000 E: 719

K.L.M. — ROYAL DUTCH AIRLINES (Koninklijke Luchtvaart Maatschappij N.V.), 1 Plesmanweg, The Hague.

Fl. 123,000,000	I. A. Aler, President F. von Balluseck, Exec. Vice-President (Traffic) M. J. van der Ploeg, Exec. Vice-President (Finance and Administration) Ir. F. Besançon, Exec. Vice-President (Production) Dr. H. L. Slotemaker, Exec. Vice-President (Air Policy) Dr. J. v. d. Wiel, Exec. Vice-President (Secretary-General)	14 Convair 340 7 Convair 240 10 Lockheed L-1049G 8 Lockheed L-1049E 10 Lockheed L-749A 8 Douglas DC-6A/B 6 Douglas DC-6 6 Douglas DC-4 15 Douglas DC-3 84	10 Douglas DC-7C 8 Douglas DC-8 jets 12 Lockheed L-188A Electra 8 Vickers V-803 Viscount 2 Fokker F.27 Friendship 41	European; Far East and Australia; U.S.A., Canada and Mexico; South America; Dutch West Indies; South Africa	R: 151,000 E: 15,000

L.A.I., LINEE AEREE ITALIANE S.p.A., 132, Via del Tritone, Rome.

Lire 5,000,000,000	Prince Avv. Marcantonio Pacelli, President Comm. Richard Mazzarini, Vice-President General Luigi Gallo, General Manager Cdt. Antonio Nervi, Administrative Manager Dr. Ricardo Naselli, Commercial Manager	3 Douglas DC-6B 3 Douglas DC-6 13 Douglas DC-3 4 Convair 240 23	6 V.770D Viscount (plus 2 V.770D and 4 V.880 on option) 4 Lockheed L-1649A (plus 6 on option) 10 (plus 12 on option)	Connects 25 major Italian towns to points in Europe, Near East, North Africa, North America.	R: 25,000 E: 1,400

LOT, POLSKIE LINIE LOTNICZE (Lignes Aériennes Polonaises « Lot »), 39 Hoza, Warsaw.

State	Andrzej Skala, Director-General Ing. W. Leja, Technical Director M. Rolski, Commercial Director M. Grabowski, Operations Director	Ilyushin Il-14 Ilyushin Il-12 Li-2 Douglas DC-3 Aero 45		To points in Western and Eastern Europe, including Moscow	R: 7,000 E: n.a.

SABENA, SOCIÉTÉ ANONYME BELGE D'EXPLOITATION DE LA NAVIGATION AÉRIENNE, 35, rue Cardinal Mercier, Brussels.

Belg. frs. 500,000,000	Gilbert Périer, Chairman Gaston Claeys, Managing Director Willem Deswarte, General Manager Gaston Dieu, Dep. General Manager Fernand De Ridder, Technical Adviser René Golstein, Secretary-General Félicien Pirson, Technical Manager Anselme Vernieuwe, Operations Manager	4 Douglas DC-6 8 Douglas DC-6B 2 Douglas DC-6A 9 Douglas DC-4 16 Douglas DC-3 2 Douglas C-49 Dakotas 10 Douglas C-47 Dakotas 2 Convair 440 5 Convair 240 4 Sikorsky S.55 6 D.H. 82 7 Saab Safir 1 Auster 2 Piper 78	9 Douglas DC-7C 4 Boeing 707 jets 10 Convair 440 8 Sikorsky S.58 31	Points in Europe and Mediterranean, North Atlantic; Belgian Congo and South Africa; domestic in Belgian Congo	R: 45,000 E: 6,500

S.A.S., SCANDINAVIAN AIRLINES SYSTEM, Stockholm 40.

Swed. Kr. 157,500,000	Henning Throne-Holst, President Sven Ostling, Executive Vice-President Viggo J. Rasmussen, Executive Vice-President Thore Boye, Executive Vice-President Nils Langhelle, Executive Vice President	14 Douglas DC-6B 12 Douglas DC-6 4 Douglas DC-4 10 Douglas DC-3 13 Convair 440 8 Saab Scandia 1 Junkers Ju 52 62	14 Douglas DC-7C 7 Douglas DC-8 jets 3 Convair 440 24	Points in Europe, North Atlantic, South Atlantic, Polar Route Europe-Greenland-U.S. West Coast; Middle and Near East	R: 99,450 E: 8,400

SWISSAIR, SOCIÉTÉ ANONYME SUISSE POUR LA NAVIGATION AÉRIENNE, Hirschengraben 84, Zurich.

Sw. Fr. 42,000,000	Dr. Rudolf Heberlein, Chairman Dr. Walter Berchtold, Managing Director Dr. Heinz Haas, Secretary-General Eugen Groh, Director of Finance Lucien L. Ambord, Director of Traffic and Sales Robert Fretz, Director of Operations Isidor Lack, Director of Engineering	6 Douglas DC-6B 3 Douglas DC-4 9 Douglas DC-3 7 Convair 240 25	4 Douglas DC-7C 2 Douglas DC-8 jets 11 Convair 440 17	Points in Europe, North America, South America, Near East	R: 25,000 E: 3,576

T.A.E. NATIONAL GREEK AIRLINES (Technical & Aeronautical Exploitations Co., Ltd.), 12, Merlin Street, Athens.

Onassis Shipping Interests	N. Averoff, Chairman and Chief Executive N. Voyatzis, Vice Chairman	1 Douglas DC-4 14 Douglas DC-3 15	*To be ordered:* 2 Douglas DC-7C 6 Viscounts 8	Middle East, Italy, France, U.K.; domestic	R: 6,350 E: 850

T.A.I., COMPAGNIE DE TRANSPORTS AÉRIENS INTERCONTINENTAUX, 23, rue de l'Amiral-d'Estaing, Paris 16e.

Fr. frs. 656,000,000	Paul Bernard, Chairman General Georges Fayet, Director-General J. J. Wilmot Roussel, Dep. Director-General J. Mathieu, Secretary-General Colonel L. Aubree, Operations Director A. Gaffie, Commercial Director	4 Douglas DC-6B 2 Douglas DC-4 3 Douglas DC-3 9	3 Douglas DC-7C	To points in North Africa and French African Colonies; Far East; Australia and New Caledonia	R: 25,000 E: 800

T.A.P., TRANSPORTES AÉREOS PORTUGUESES, S.A.R.L., Rua Braamcamp, No. 2, Lisbon, Portugal.

Esc. 120,000,000	Eng. D. Francisco de Mello e Castro, Chairman Dr. Ernesto Coelho, Secretary-General Henrique da Costa Pessoa, Commercial Manager Roger de Avelar, Operations Superintendent Eng. Jorge Carregal Ferreira, Maintenance Superintendent	3 Lockheed L-1049G 3 Douglas DC-4 6 Douglas DC-3 12		To Portuguese African Colonies; points in Europe and North Africa	R: 8,750 E: 760

U.A.T., UNION AÉROMARITIME DE TRANSPORT, 5, boulevard Malesherbes, Paris 8e.

Fr. frs. 51,000,000	Louis Vidal, Chairman and Managing Director J. Combard, Director R. Loubry, Director A. Veillard, Deputy Director J. P. Villaceque, Deputy Director	7 Douglas DC-6 1 Douglas DC-4 4 Nord 2501 8 D.H. Heron 20		Points in French West Africa, French Equatorial Africa, South Africa	R: 16,000 E: 1,350

U.S.A. AND CANADA

AMERICAN AIRLINES, INC., 100 Park Avenue, New York City, New York.

$146,872,000, including credits and debentures	C. R. Smith, President W. J. Hogan, Senior Vice President, Finance C. W. Jacob, Senior Vice President and Secretary O. M. Mosier, Senior Vice President, Operations C. R. Speers, Senior Vice President, Sales	40 Douglas DC-7 75 Douglas DC-6 type 7 Douglas DC-6A 74 Convair 240 4 Miscellaneous 200	22 Douglas DC-6 and DC-7 type 35 Lockheed Electra 30 Boeing 707 jets 87	U.S. transcontinental to 77 cities in the United States, Canada and Mexico	R: 14,505 E: 20,000

BRANIFF INTERNATIONAL AIRWAYS INC., Love Field, Dallas 9, Texas.

$23,479,180, capital and surplus	Charles E. Beard, President J. W. Miller, Exec. Vice President C. G. Adams, Vice President (Finance) and Secretary Rex K. Brack, Vice President (Traffic and Sales) R. V. Carleton, Vice President (Operations)	9 Douglas DC-6 22 Douglas DC-3 1 Douglas C-47 2 Lockheed L-749 25 Convair 340 2 Curtiss C-46 61	7 Douglas DC-7C 5 Boeing 707 jets 9 Lockheed Electra 5 Convair 440 26	Points in the Central U.S.A.; West Coast services to South America	R: 16,420 E: 4,430

COLONIAL AIRLINES INC. — merged with Eastern Air Lines earlier this year.

C.P.A.L., CANADIAN PACIFIC AIR LINES LIMITED, Vancouver Airport, B.C.

Wholly-owned subsidiary of Canadian Pacific Railway Co.	G. W. G. McConachie, President R. W. Ryan, Executive Vice President R. B. Phillips, Vice President, Operations H. B. Renwick, Vice President, Traffic	6 Douglas DC-6B 1 Douglas DC-4 14 Douglas DC-3 5 Convair 240 8 Curtiss C-46F 2 D.H. Otter 2 Convair Canso 38	6 Douglas DC-6B 5 Britannia 314 11	To Far East, Australia, South America, Europe; domestic	R: 41,300 E: 1,800

DELTA AIR LINES INC., Atlanta Airport, Atlanta, Ga.

$28,357,000	R. W. Freeman, Chairman C. W. Woolman, President and Gen. Mgr. Laigh C. Parker, Vice President (Traffic and Sales) Charles H. Dolson, Vice President (Operations) T. G. Cole, Vice President (Finance)	11 Douglas DC-7 7 Douglas DC-6 16 Douglas DC-3 20 Convair 340 4 Lockheed Constellation 58	10 Douglas DC-7 6 Douglas DC-8 jets 8 Convair 440 10 Convair 880 jets 34	U.S. domestic, Chicago to Dallas, New Orleans, Miami; New Orleans to Cuba, Puerto Rico, Venezuela	R: 10,765 E: 5,200

* **E.A.L., EASTERN AIR LINES, INC.**, Eastern Air Lines Building, 10 Rockefeller Plaza, New York 20, New York.

Nom. Auth. $5,000,000 Recently merged with Colonial Airlines	E. V. Rickenbacker, Chairman Thomas F. Armstrong, President Paul H. Brattain, First Vice President Sidney L. Shannon, Senior Vice President (Operations) M. M. Frost, Vice President (Traffic & Sales)	16 Lockheed L-1049C 13 Lockheed L-1049A 18 Lockheed L-749 12 Douglas DC-7B 1 Douglas DC-4 60 Martin 4-O-4 120 From Colonial Airlines: 5 Douglas DC-4 8 Douglas DC-3 13	10 Lockheed 1049G 40 Lockheed Electra 28 Douglas DC-7B 20 Douglas DC-8 jets 15 Convair 440 113	Domestic, mostly North-South in Eastern U.S.A.; seeking Mexico City route	R: 7,500 E: 11,000

NATIONAL AIRLINES, INC., 3240 N.W. 27th Ave., Miami 42, Florida.

Auth: 1,600,000 Shares Issued: 1,037,952 Shares	G. T. Baker, President and Chairman J. C. Brawner, Senior Vice President and Treasurer C. E. Banks, Vice President-Production R. E. Wieland, Vice President L. W. Dymond, Assistant Vice President-Operations W. A. Perry, Assistant Vice President & General Sales Manager	4 Douglas DC-7 8 Douglas DC-6B 4 Douglas DC-6 12 Convair 340 6 Convair 440 11 Lockheed Lodestars 45	4 Douglas DC-7B 6 Douglas DC-8 jets 23 Lockheed Electra 33	U.S. East Coast from Miami; to Cuba	R: 2,829 E: 3,000

* **N.Y.A., NEW YORK AIRWAYS, INC.**, P.O. Box 426, LaGuardia Airport, Flushing 71, New York.

$2,432,279	John L. Senior, Jr., Chairman Robert L. Cummings, Jr., President Horace Brock, Vice President	3 Sikorsky S-58 5 Sikorsky S-55 8	5 Sikorsky S-58	Helicopter feeder services in New York area	R: Abt. 300 E: 150

NORTHWEST AIRLINES, INC., 1885 University Avenue, St .Paul 4, Minnesota.

Net worth end of 1955: $28,228,484	Croil Hunter, Chairman Donald W. Nyrop, President Malcolm S. Mackay, Exec. Vice President Frank C. Judd, Vice President Operations & Engineering Gordon M. Bain, Vice President Sales	4 Lockheed 1049G 9 Boeing Stratocruiser 10 Douglas DC-6B 18 Douglas DC-4 6 Douglas DC-3 47	7 Douglas DC-6B 8 Douglas DC-7C 15	New York and Washington, D.C., to Seattle; to Hawaii, to Alaska and the Orient	R: 17,253 E: 5,700

P.A.A., PAN AMERICAN WORLD AIRWAYS, 135 East 42nd Street, New York 17, New York.

6,158,461 shares of $1.00 par issued	Juan T. Trippe, President John C. Leslie, Vice President (Administration) Samuel F. Pryor, Vice President and Assistant to the President Henry J. Friendly, Vice President and General Counsel Roger Lewis, Executive Vice President-Development and Defense Projects Willis G. Lipscomb, Vice President-Traffic and Sales Erwin Balluder, Vice President	26 Boeing Stratocruisers 7 Douglas DC-7B 45 Douglas DC-6B 3 Douglas DC-6A 15 Douglas DC-4 pass. 11 Douglas DC-4 cargo 5 Douglas DC-3 6 Lockheed L-49 5 Convair 240 123	23 Boeing 707 jets 25 Douglas DC-8 jets 33 Douglas DC-7C 4 Douglas DC-6 leased from Panagra 85	Exclusively U.S. overseas—trans-Atlantic, trans-Pacific, Latin America, Far East, Australasia	R: 63,155 E: 19,300

PANAGRA, PAN AMERICAN-GRACE AIRWAYS, INC., 135 East 42nd Street, New York 17, New York.

$7,500,000	Andrew B. Shea, President Douglas Campbell, Vice President & General Manager Thomas J. Kirkland, Vice President Operations Kenneth A. Lawder, Vice President & Comptroller Edward G. Bern, Vice President & Sales Manager	5 Douglas DC-7B 5 Douglas DC-6B 4 Douglas DC-6 3 Douglas DC-4 5 Douglas DC-3 22	4 Douglas DC-8 jets 1 Douglas DC-7B 5	Panama to Colombia, Ecuador, Peru, Bolivia, Chile and Argentina	R: 5,450 E: 1,400

SEABOARD AND WESTERN AIRLINES INC., 80 Broad Street, New York 4, New York.

Issued 954,000 shares; net worth $7,900,000	Raymond A. Norden, President Arthur V. Norden, Exec. Vice Pres. and Treasurer Carl D. Brell, Vice President (Operations) Wallace P. Neth, Vice President (Traffic)	5 Lockheed L-1049B 5 Douglas DC-4 10	5 Lockheed L-1049H	Scheduled Atlantic cargo services to 13 points in Europe	R: 6,430 E: 670

T.C.A., TRANS-CANADA AIR LINES, 1080 University Avenue, Montreal, Quebec.

Common stock, $5,000,000 ; Short term Loans, $13,500,000 Debentures, $20,000,000 Total $38,500,000	G. R. McGregor, President W. Gordon Wood, Vice President, Sales W. F. English, Vice President, Operations	18 Vickers Viscount 9 Lockheed L-1049 22 Canadair North Star 26 Douglas DC-3 75	4 Douglas DC-8 jets 18 Vickers Viscount 22	Transatlantic to U.K., France, Germany; to U.S.A.; Canadian trans-Continental	R: 23,700 E: 8,500

T.W.A., TRANS WORLD AIRLINES, INC., 380 Madison Avenue, New York 17, New York.

3,337,000 shares of $5.00 par issued	Warren Lee Pierson, Chairman J. A. Collings, Exec. Vice President E. O. Cocke, Senior Vice President (Sales) A. V. Leslie, Senior Vice President (Finance) Frank E. Busch, Vice President (Operations) R. W. Rummel, Vice President (Engineering)	24 Lockheed L-1049G 9 Lockheed L-1049 71 Lockheed L-49 and L-749 49 Martin 4-O-4 and 2-O-2 11 Douglas DC-4 5 Douglas DC-3 169	25 Lockheed L-1649A 4 Lockheed L-1049G 8 Boeing 707 jets 30 Convair 880 jets 67	U.S. trans-Continental, domestic; trans-Atlantic to North and South Europe; Near and Middle East	R: 35,000 E: 17,000

UNITED AIR LINES, INC., 5959 South Cicero Avenue, Chicago 38, Illinois.

Stockholders' equity $101,112,000, Long-term debt $37,012,000 Total $138,124,000	W. A. Patterson, President J. A. Herlihy, Vice President-Engineering & Maintenance D. F. Magarell, Vice President-Transportation Services Curtis Barkes, Vice President-Finance & Property R. W. Ireland, Vice President-Traffic	27 Douglas DC-7 27 Douglas DC-6B 42 Douglas DC-6 3 Douglas DC-6A 19 Douglas DC-4 13 Douglas DC-3 55 Convair 340 186	30 Douglas DC-8 jets 21 Douglas DC-7 10 Douglas DC-6B 2 Douglas DC-6A 63	U.S. trans-Continental; to West Canada and Hawaii	R: 11,250 E: 19,400

LATIN AMERICA

AEROLINEAS ARGENTINAS E.N.T., Paseo Colon 185, Buenos Aires, Argentina.

Pesos 1,000,000,000	Arturo Estebal Llavallol, President Vice Commodore Anibal Becher, Vice President Juan Carlos Mason Lugones, General Manager	6 Douglas DC-6 5 Douglas DC-4 14 Douglas DC-3 2 Douglas C-47 4 Convair 240 7 Short Sandringham 1 Beech C-45 39		Domestic; international Latin America; New York; Europe	R: 37,000 E: 5,400

AVIANCA, AEROVIAS NACIONALES DE COLOMBIA, 7a Carrera, Nos. 16-14, Bogota, Colombia.

Issued Pesos 15,000,000	Juan Guillermo Restrepo Jaramillo, President and General Manager J. A. Gonzalez Piedrahita, Exec. Vice President Juan Veros, General Manager (Traffic and Sales, International) Alberto Farios, General Manager (Traffic and Sales National)	4 Lockheed L-1049C 13 Douglas DC-4 23 Douglas DC-3 11 Douglas C-47 20 Miscellaneous 71		Domestic, Latin America, U.S.A., Europe	R: 14,570 E: 5,000

CUBANA, COMPANIA CUBANA DE AVIAÇION S.A., Aeropuerto Internacional " José Martí ", Rancho Boyeros, Havana,Cuba.

Pesos 4,105,000	José Lopez Vilaboy, President Juan M. Palli, Vice President and General Manager Oscar Bustillo, Traffic and Sales Manager Capt. Guillermo G. Biscay, Chief of Operations	2 Lockheed L-1049G 1 Lockheed L-49 3 Vickers Viscount 7 Douglas DC-3 1 Curtiss C-46 14		Domestic; to U.S.A., Mexico, Portugal, Spain	R: 10,000 E: 700

CRUZEIRO, SERVIÇOS AEREOS CRUZEIRO DO SUL, LTDA., 128 Avenida Rio Branco, P.O. Box 190, Rio de Janeiro, Brazil.

Cr. 20,000,000	Dr. J. B. R. Dantas, President J. Q. V. de Carvalho, Comm. Director Col. F. A. Rocha, Oper. Director	4 Convair 340 35 Douglas DC-3 4 Beech C-45 43		Domestic; South American international	R: 12,300 E: 3,200

GUEST AEROVIAS MEXICO S.A., 95 Paseo de la Reforma, Mexico City.

Mex. $5,000,000	Winston Guest, President G. L. Monteiro, Exec. Vice President and General Manager J. R. Joyce, Director of Traffic & Sales	Douglas DC-4 Lockheed L-749		To Panama, Miami, Windsor (Ont.)	R: 2,500 E: 300

L.A.N., LINEA AEREA NACIONAL (CHILE), Teatinos 384, Santiago de Chile.

Pesos 1,674,890,400	A. Fernandez, President A. Bermudez, Technical Manager	3 Douglas DC-6B 17 Douglas DC-3 4 Martin 2-O-2 3 Miscellaneous 27		Domestic; S. American international	R: 8,500 E: 700

L.A.V., LINEA AEROPOSTAL VENEZOLANA, Bloque 1, El Silencio, Caracas, Venezuela.

Bolivares 50,209,000	Col. Abel Romero Villate, President Jorge Roig, General Traffic Manager Capt. Miguel Torres, Technical Manager	2 Lockheed L-1049C 2 Lockheed L-749 3 Vickers Viscount 749 18 Douglas DC-3 2 Martin 2-O-2 4 Curtiss C-46 31	1 Lockheed L-1049G	Domestic; S. American international; U.S.A.; Portugal, Spain, Italy	R: 16,650 E: 1,820

P.A.B., PANAIR DO BRASIL, S.A., Santos Dumont Airport, Rio de Janeiro, Brazil.

Cr. 88,000,000	Dr. Argemiro Hungria da S. Machado, President Dr. Cesar Pires de Mello, Director-Superintendent	11 Lockheed L-749 8 Douglas DC-3 1 Convair PBY 20	4 Douglas DC-7C	To European capitals, Near East	R: 25,200 E: 3,700

VARIG, S.A., EMPRÊSA DE VIAÇAO AÉREA RIO GRANDENSE, Av. Borges de Medeiros 410-16°, P.O. Box 243, Pôrto Alegre — RGS — Brazil.

Cr. 30,000,000	Rubem M. Berta, President Oscar Siebel, Deputy Manager Goetz G. Herzfeldt, Operations Mgr. Paulo A. Dietzold, Maintenance Mgr.	3 Lockheed L-1049C 23 Douglas C-47 14 Curtiss C-46 5 Convair 240 45	2 Lockheed L-1049C	Brazilian domestic; to New York	R: 17,600 E: 3,700

AFRICA

AIR ALGÉRIE, COMPAGNIE GÉNÉRALE DE TRANSPORTS AÉRIENS, 46 Boulevard Saint-Saëns, Algiers, Algeria.

Fr. frs. 1,250,000,000	Jean Richard-Deshais, President and Director General Colonel Jacques Soufflet, Executive Director and Assistant to President M. Rey, Technical Manager M. Benard, Operations Manager M. Louis Houis, Commercial Manager	2 Lockheed L-749 5 Douglas DC-4 3 Douglas DC-3 10		Algeria to Sahara, points in France, Switzerland, Balearic Islands	R: 16,200 E: 500

C.A.A., CENTRAL AFRICAN AIRWAYS CORP., P.O. Box 1979, Belvedere Airport, Salisbury, Southern Rhodesia.

£914,000	P. J. B. Wimbush, General Manager V. H. Greager, Engineering Manager R. A. Bourlay, Oper. Manager	5 Vickers Viscount 700D 10 Vickers Viking 5 Douglas DC-3 6 D.H. Beaver 26		To London; South Africa, Kenya, Tanganyika, Port. East Africa	R: 15,000 E: 1,000

D.E.T.A., DIVISAO DE EXPLORAÇAO DOS TRANSPORTES AÉREOS, Rua Araujo, 103-2° Esq. — Lourenço Marques, Mozambique.

State	A. P. Pereira Leite, Director General Lt. Colonel A. H. Pinho da Cunha, Manager Abel Neves de Azevedo, Chief Engineer	3 Douglas DC-3 3 Lockheed Lodestar 6 D.H. Dove 4 D.H. Dragon Rapide 2 Junkers Ju 52 18		Lourenço Marques to S. Africa and adjoining areas	R: 3,000 E: 750

D.T.A., DIVISAO DOS TRANSPORTES AÉREOS, Caixa Postal 79, Luanda, Angola.

State	R. Serrao, Director-General J. de S. Medina, Manager	5 Douglas DC-3 4 Beech 18 7 D.H. Dragon Rapide 16		Port. West Africa domestic; to Belgian Congo	R: 3,300 E: 350

E.A.A.C., EAST AFRICAN AIRWAYS CORPORATION, Airways Terminal, Sadler Street, P.O. Box 1010, Nairobi, Kenya.

£221,500	Sir Alfred Vincent, Chairman Lt.-Col. M. C. P. Mostert, General Manager A. E. Robinson, Chief Inspector and Engineering Manager Captain P. A. Travers, Sales Manager	9 Douglas DC-3 4 D.H. Dragon Rapide 1 Airspeed Consul 14		East African	R: 15,575 E: 1,230

MISRAIR, EGYPTIAN AIRLINES, Almaza Airport, Heliopolis, Egypt.

£(E.)1,350,000	Air Vice Marshal Ahmad Ibrahim Abdel Razek, Chairman Abdel Salam Osman, Managing Director Air Commodore Mahmoud Sidky el Meligi, General Manager Mohamed Fouad Raafat, Deputy General Manager (Commercial) Capt. Hussein Tewfik, Deputy General Manager (Technical)	3 Vickers Viscount 7 Vickers Viking 1 Beech 18 11		To points in Europe, Africa and Near East	R: 9,950 E: 1,250

S.A.A., SOUTH AFRICAN AIRWAYS, Railway Headquarters, Johannesburg, South Africa.

£5,498,839	D. H. C. du Plessis, General Manager D. M. Robbertze, Deputy General Manager J. G. Grové, Assistant General Manager (Commercial) J. D. T. Louw, Chief Airways Manager	3 Douglas DC-7B 7 Douglas DC-4 6 Douglas DC-3 4 Lockheed L-749 20	7 Vickers Viscount 810D	Domestic; points in Africa; to European capitals	R: 26,600 E: 2,200

W.A.A.C., WEST AFRICAN AIRWAYS CORPORATION, Airways House, 161 Broad Street, Marina (P.O. Box 136), Lagos, Nigeria.

£465,000	R. W. C. Baker-Beall, Chairman D. Malcolm-Brown, General Manager A. S. M. Furniss, Deputy General Manager R. R. R. Allen, Chief Engineer	2 Bristol 170 8 D.H. Heron 5 D.H. Dove 15		Nigerian domestic; other points in West Africa	R: 7,850 E: 1,100

NEAR AND FAR EAST

AIR CEYLON LIMITED, Hemas Building, York Street, Colombo 1, Ceylon.

Authorized Rs. 15,000,000	J. L. M. Fernando, Managing Director M. Van Haselen, Deputy Managing Director Kenneth de Croos, Manager	2 Douglas DC-3 1 Lockheed L-749A 3		Domestic; Ceylon to Italy, U.K., Amsterdam, etc.	R: 13,700 E: 225

AIR-INDIA INTERNATIONAL CORPORATION, New India Assurance Building, Mahatma Gandhi Road, Fort, Bombay.

Rs. 96,680,000	J. R. D. Tata, Chairman B. R. Patel, General Manager A. C. Gazdar, Operations & Engineering Manager S. K. Kooka, Traffic Manager	3 Lockheed L-749A 6 Lockheed L-1049E and G 1 Douglas C-47 10	2 Lockheed L-1049G	Bombay to London and points in Europe; Nairobi, Singapore, Japan	R: 19,000 E: 3,500

AIR LIBAN, Place Assour, Beirut.

£(Leb.)5,000,000	Basile Meguerdiche, Director General Louis Lanata, Dep. Dir. Gen. and Technical Director J. P. Serrant, Director	2 Douglas DC-4 3 Douglas DC-3 1 S.E.160 Languedoc 3 Avro York (on lease) 9	2 Douglas DC-6B	Points in Middle East and Africa	R: 8,600 E: 321

AIR VIETNAM, 116 Boulevard Nguyen-Hue, P.O. Box 217, Saigon, Vietnam.

18,000,000 Piastres	Nguyen-Van-Khai, Chairman J. Perin, Vice Chairman Nguyen-Tan-Trung, Manager	6 Douglas DC-3 4 Bristol 170 1 Boeing Stratoliner 11		Saigon to Hong Kong; points in Southeast Asia; domestic	R: 12,000 E: 700

C.A.T., CIVIL AIR TRANSPORT, Taipei, Taiwan (Formosa).

Not available	C. L. Chennault, Chairman Hugh L. Grundy, President & General Manager C. J. Rosbert, Vice President & Assistant General Manager R. E. Rousselot, Vice President (Oper.) Allan Wueste, Vice President (Tech.)	2 Douglas DC-4 2 Douglas DC-3 3 Douglas C-47 22 Curtiss C-46 2 Convair PBY 31		Far Eastern, to Japan, Korea, Hong Kong, Philippines, Thailand, etc.	R: 6,800 E: 2,600

CYPRUS AIRWAYS LIMITED, 36, Homer Avenue, Nicosia, Cyprus.

Authorized: $250,000 Issued: $185,000	Dr. C. Raeburn, Chairman J. A. Vick, General Manager S. M. Killingbeck, Commercial Manager	4 Douglas DC-3		To Greece, Turkey, Near East	R: 2,060 E: 150

EL AL, ISRAEL AIRLINES LTD., 76 Maze Street, P.O. Box 438, Tel Aviv-Yafo, Israel.

Not available	L. A. Pincus, Managing Director Y. Palgi, Deputy Managing Director (Oper. and Production) A. Rywkind, Deputy Managing Director (Commercial)	5 Lockheed L-49 3 Curtiss C-46 1 Consul 9	3 Bristol Britannia 313	Israel to Europe and U.S.A.; to South Africa	R: 12,200 E: 1,100

GARUDA INDONESIAN AIRWAYS N.V., 15 Dj. Nusantara, Djakarta, Indonesia.

Rp. 90,000,000	Dr. M. Sutoto, President Director Dr. R. Sugoto, Managing Director D. K. van Houten, Managing Director Dr. C. A. Mochtar, Deputy Director Dr. Yap Kie Tik, Deputy Director	8 Convair 340 8 Convair 240 20 Douglas DC-3 and C-47 14 D.H. Heron 50		Domestic Indonesian; points in Far East	R: 19,000 E: 3,600

IRAQI AIRWAYS, New Railway Station Building, Baghdad West, Iraq.

£2,000,000	Kanaan Al Askari, Manager A. D. Bennett, Technical Adviser T. Walters, Flight Captain	3 Vickers Viscount 3 Vickers Viking 1 D.H. Dove 7	1 Vickers Viscount	Points in Near and Middle East; Vienna, London	R: 11,540 E: 400

JAPAN AIR LINES COMPANY, LTD., 2-3-2 Marunouchi, Chiyodaku, Tokyo, Japan.

5,700,000,000 Yen	Seijiro Yanagita, President Kambu Ishikawa, Vice President Shizuma Matsuo, Managing Director Tetsuo Oba, Managing Director, Operations & Eng. Kinjiro Yuchi, Managing Director, Finance & Supply	5 Douglas DC-6B 8 Douglas DC-4 3 D.H. Heron 1 Beechcraft 17	4 Douglas DC-7C 4 Douglas DC-8 jets 8	Domestic; trans-Pacific to San Francisco; to Hong Kong; Bangkok	R: 12,000 E: 1,200

M.A.L., MALAYAN AIRWAYS LTD., Ocean Building, Collyer Quay, Singapore 1.

Authorized: M$5,000,000 Issued: M$2,500,000	F. L. Lane, Chairman R. P. Mollard, Managing Director J. Skeldon, Manager A. G. Beohm, Traffic Manager	11 Douglas DC-3 3 D.H. 89 Rapide 14		Points in Malaya, Thailand	R: 4,856 E: 836

M.E.A., MIDDLE EAST AIRLINES CO. S.A., Yared Building, Abdul Aziz Street, Beirut, Lebanon.

Not available	H. E. Saeb Bey Salaam, Chairman Sheikh Najib Alamuddin, Managing Director Cyril Essely, Deputy General Manager E. C. Terleske, Assistant General Manager (Finance) Salim Salaam, Assistant General Manager (Sales) Captain R. Hornall, Operations Manager	4 Douglas DC-3 3 Vickers Viscount 1 Bristol 170 8		Points in Near East; to Rome, Paris, London, Athens, Vienna, Zurich	R: 10,600 E: 660

P.A.L., PHILIPPINE AIR LINES, M.R.S. Building, Plaza Cervantes, Manila, Philippines.

Not available	Col. Andres Soriano, President A. M. McLeod, 1st Vice President R. Yoga, Vice President (Treasurer)	29 Douglas DC-3 3 Convair 340 2 D.H.C. Otter 4 Norseman 5 Hiller 12-B helicopters 43	2 Vickers Viscount 770D	Domestic Philippines; Hong Kong	R: 5,000 E: n.a.

P.I.A., PAKISTAN INTERNATIONAL AIRLINES CORP., Central Hotel Building, M. A. Khuro Road, Karachi, Pakistan.

State	Mirza Ahmed Ispahani, Chairman Zafarul Ahsan, General Manager Enver Jamall, Engr. Manager J. S. Mirza, Traffic & Sales Mgr. Capt. Donovon, Flight Oper. Mgr.	3 Lockheed L-1049C 4 Convair 240 11 Douglas DC-3 18	3 Vickers Viscount 810D plus 2 on option	Karachi to Cairo, Geneva, London; to points in Pakistan, India, Burma	R: 10,900 E: 2,100

AUSTRALIA AND NEW ZEALAND

*** A.N.A., AUSTRALIAN NATIONAL AIRWAYS PTY. LTD.**, 289 William Street, Melbourne, Australia.

₣A1,500,000	Sir Ivan Holyman, Chairman & Managing Director F. Kay, General Manager J. O. Declerck, Finance Manager G. H. Archibald, Operations Manager I. G. Webster, Traffic & Sales Manager	4 Douglas DC-6B 2 Douglas DC-6 8 Douglas DC-4 15 Douglas DC-3 3 Bristol 170 1 Bristol 171 helicopter 33		Australian domestic	R: 17,420 E: 3,550

*** NEW ZEALAND NATIONAL AIRWAYS CORPORATION**, Aotea Quay, P.O. Box 96, Wellington, New Zealand.

£NZ.1,200,000	Air Vice-Marshal Sir Leonard Isitt, Chairman J. J. Busch, General Manager H. W. Walker, Operations Manager W. J. Jennings, Commercial Manager	21 Douglas DC-3 3 Douglas C-47 4 D.H. Heron 6 D.H. Rapide 34		New Zealand domestic	R: 3,680 E: n.a.

QANTAS EMPIRE AIRWAYS LIMITED, Shell House, Carrington Street, Sydney, N.S.W., Australia.

£A.5,000,000	Sir Hudson Fysh, Chairman W. C. Taylor, Vice Chairman C. O. Turner, Chief Executive and General Manager C. W. Nielson, Commercial Manager R. J. Ritchie, Technical Manager	12 Lockheed L-1049 5 Douglas DC-4 8 Douglas DC-3 2 Convair PBY 4 D.H.C. Beaver 1 D.H.A. Drover 32	2 Lockheed L-1049H	Sydney to London via Middle East; trans-Pacific to U.S.A. and Canada; to South Africa, Far East	R: 62,200 E: 5,650

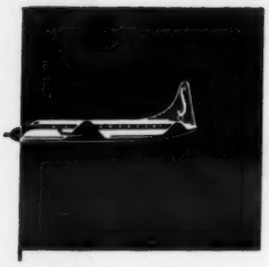
TASMAN EMPIRE AIRWAYS LIMITED, Mechanics' Bay, P.O. Box 2201, Auckland, New Zealand.

Authorized: £NZ.2,000,000	G. N. Roberts, General Manager and Chief Executive F. A. Reeves, Assistant General Manager (Technical) Captain K. A. Brownjohn, Operations Manager	3 Douglas DC-6 2 Short Solent 5		Between Australia and New Zealand; to Pacific Island points	R: 8,860 E: 775

*** TRANS-AUSTRALIA AIRLINES**, 339 Swanston Street, Melbourne, C.1, Australia.

State	John P. Ryland, General Manager J. L. Watkins, Director of Engineering R. E. Pope, Director of Finance R. E. Bailey, Director of Operations	9 Vickers Viscount 2 Convair 240 4 Douglas DC-4 18 Douglas DC-3 4 Douglas C-47 3 D.H.A. Drover 40	2 Vickers Viscount	Australian domestic	R: 32,000 E: 3,500

* Associate Member of I.A.T.A.



this radar RCA is fitted in the

(Radio Corporation of America)

Metropolitan

in service on Sabena's European network

PARIS	LONDON	FRANKFURT	STOCKHOLM
Flying time . . 1 hr 10 Return fare 1.080 Bel. fr. $ 21,60 (tourist)	Flying time . . 1 hr 25 Return fare 1,960 Bel. fr. £ 14.0.0 (tourist)	Flying time . . 1 hr 20 Return fare 1,620 Bel. fr. $ 32.40 (tourist)	Flying time . . 4 hr 30 Return fare 6,870 Bel. fr. $ 137,40 (tourist)
PALMA	**AMSTERDAM**	**COPENHAGEN**	**GENEVA**
Flying time . . 4 hr 05 Return fare 4,825 Bel. fr. $ 96,70 (tourist)	Flying time . . 0 hr 50 Return fare 715 Bel. fr. $ 14,30 (tourist)	Flying time . . 2 hr 50 Return fare 4,405 Bel. fr. $ 88,10 (tourist)	Flying time . . 2 hr 00 Return fare 2,450 Bel. fr. (tourist) $ 47,— Special return fare valid 23 days . 2,060 Bel. fr. $ 41,20

The Metropolitans will be progressively placed in service on the above routes

SABENA

DC means

First in world aviation

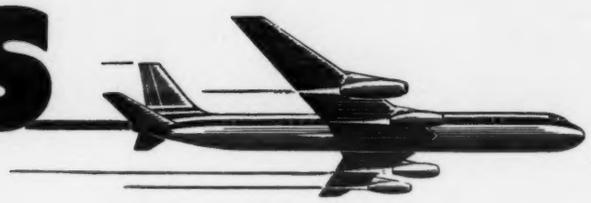
These 46 airlines have purchased

	DC-6 & 7 series delivered or on order	DC-8 on order
AEROLINEAS ARGENTINAS	6	
ALASKA AIRLINES	2	
ALITALIA	10	
AMERICAN AIRLINES	143	
ARABIAN AMERICAN OIL COMPANY	3	
AUSTRALIAN NATIONAL AIRWAYS	4	
BRANIFF INTERNATIONAL AIRWAYS	16	
BRITISH OVERSEAS AIRWAYS CORP.	10	
CANADIAN PACIFIC AIR LINES	14	
CATHAY PACIFIC AIRWAYS	1	
CIA. MEXICANA DE AVIACION	9	
CONTINENTAL AIR LINES	8	
DELTA AIR LINES	28	8
EASTERN AIR LINES	50	20
FLYING TIGER LINE	7	
JAPAN AIR LINES	8	4
KLM ROYAL DUTCH AIRLINES	27	8
LINEA AEREA NACIONAL DE CHILE	3	
LINEE AEREE ITALIANE	8	
LOS ANGELES AIR SERVICE	2	
MARITIME CENTRAL AIRWAYS	2	
NATIONAL AIRLINES	24	6
NEVADA AERO TRADES	4	

In jet powered or piston powered aircraft, Douglas airliners are first choice

TWICE AS MANY PEOPLE FLY DOUGLAS

DOUGLAS



... today and tomorrow

949 modern pressurized DC airplanes

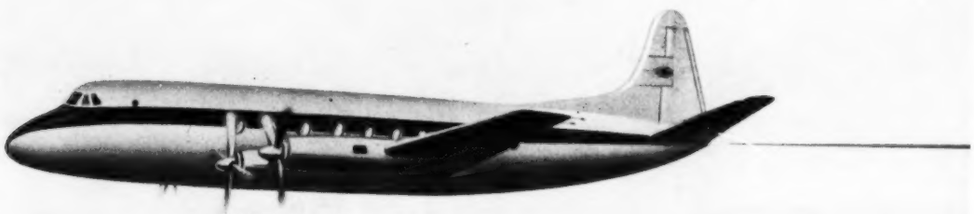
	DC-6 & 7 series delivered or on order	DC-8 on order
NORTHEAST AIRLINES	10	
NORTHWEST AIRLINES	25	
OVERSEAS NATIONAL AIRWAYS	5	
PANAIR DO BRASIL	4	
PANAGRA	16	4
PAN AMERICAN WORLD AIRWAYS	80	21
PHILIPPINE AIR LINES	7	
REAL AEROVIAS BRASIL	3	
RIDDLE AIRLINES	1	
SABENA	25	
SCANDINAVIAN AIRLINES SYSTEM	41	7
SLICK AIRWAYS	11	
SOUTH AFRICAN AIRWAYS	4	
S. S. W. INC.	2	
SWISSAIR	10	2
T. A. I.	8	
TASMAN EMPIRE AIRWAYS	4	
TRANS AMERICAN AIRLINES	7	
TRANS-CANADA AIR LINES		4
TRANS CARIBBEAN AIRWAYS	4	
U. A. T.	3	
UNITED AIR LINES	150	30
WESTERN AIR LINES	26	
TOTALS	835	114

(49 additional DC-8s have been optioned)

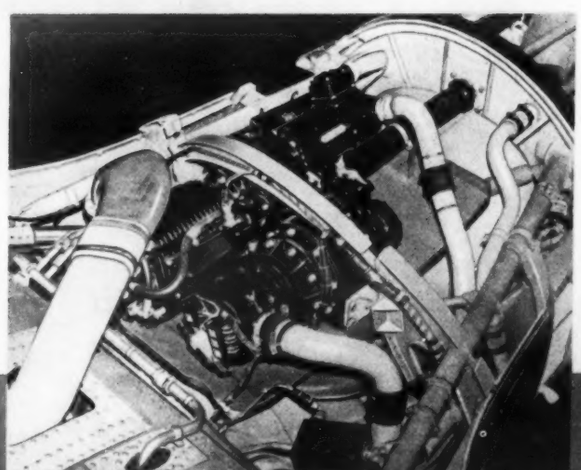
of the men who know passenger transports best...the airline presidents!

AS ALL OTHER AIRPLANES COMBINED

Accessory Drive Equipment....



ROTOL have todate produced gearbox equipment for over two hundred and fifty different types of aircraft



The Gearbox fitted to the Rolls-Royce Dart Engine on the Vickers Viscount

ROTOL

GLOUCESTER ENGLAND

Brief Analysis of American and European Air Transport

Passenger handling in Europe: London Airport.

A Continent Lags Behind

Thirty times more passengers in the European than the American air transport system? Yes, that has happened . . . not in 1956, however, but three decades ago. In 1926, the year in which Juan Terry Trippe was organizing Pan American Airways, the Europeans already had numerous, very respectable major airlines. K.L.M. Royal Dutch Airlines was feeling its way towards the Netherlands East Indies; Britain had the rich Imperial Airways; in France there was the Aéropostale, Air Union and others; and in Germany the Deutsche Lufthansa was emerging from the Aero Lloyd. In that year the airlines of twelve European countries carried approximately 164,000 passengers[1], whereas the Americans did not manage to scrape together more than 5,800 passengers[2].

How do things stand today? A table published in the 1955 Annual Report of the I.C.A.O. Council compares the populations and the air passenger volumes of three regions. By supplementing this compilation with figures —based on estimates—for Europe, one obtains the picture sketched in the table on this page.

Passenger traffic volume, route planning, scheduling, payload factors, operating costs . . . no matter which criterion is taken, there is no question that the Old Continent does alarmingly badly. Incidentally, Europe would even be unable to contribute comparative statistics, were it not for six European companies who in 1952 had the wise idea of creating the "Air Research Bureau"[3] in Brussels, a private organization which tenaciously endeavours to create for European air transport the precise system of reporting without which any economic planning must remain mere patchwork.

	Population 1955 (Millions)	Passengers 1955 (Millions)
U.S.A.	165	38.9
Canada	15.6	1.7
Australia	9.0	2.0
Western Europe	250	5—5.5 *

* The A.R.B. companies carried about 4,100,000 passengers. Their passenger traffic volume amounts to about 80 percent of the total European passenger traffic volume.

In comparison, American air transport has for many years enjoyed an efficient fact-recording system organized on a continental scale. Called to the telephone in the middle of the night, any employee of the Air Transport Association, the Civil Aeronautics Board, the Civil Aeronautics Administration or the Aircraft Industries Association could from memory recite the operational figures or the financial results achieved by American air transport—and that for the past year, half-year or decade. To obtain the corresponding figures for Europe, it would be necessary to telephone 31 airlines in 19 countries, and it would soon become apparent that the statistical records of the various companies are established on widely differing bases.

In other words, American air transport can furnish precise figures for a comparative analysis, whereas at the moment Europe contributes mainly estimates and problems.

America's figures for 1955

"The air passenger-transport business, on the eve of its thirtieth birthday, is in vigorous shape and is destined to grow even stronger in the next five years. I do not say 'fat shape'; by its nature the airline business, operating on a low-profit margin, is lean and muscular, rather than opulent. But it is gearing itself to serve a vastly growing market, more efficiently than ever before, and my outlook for the industry in the 1960's is optimistic."

This bill of health was granted a few weeks ago to American air transport by Cyrus R. Smith, President of the big American Airlines. And Smith's favourable opinion is confirmed in the 1955 report on the industry issued by the Air Transport Association of America.[4]

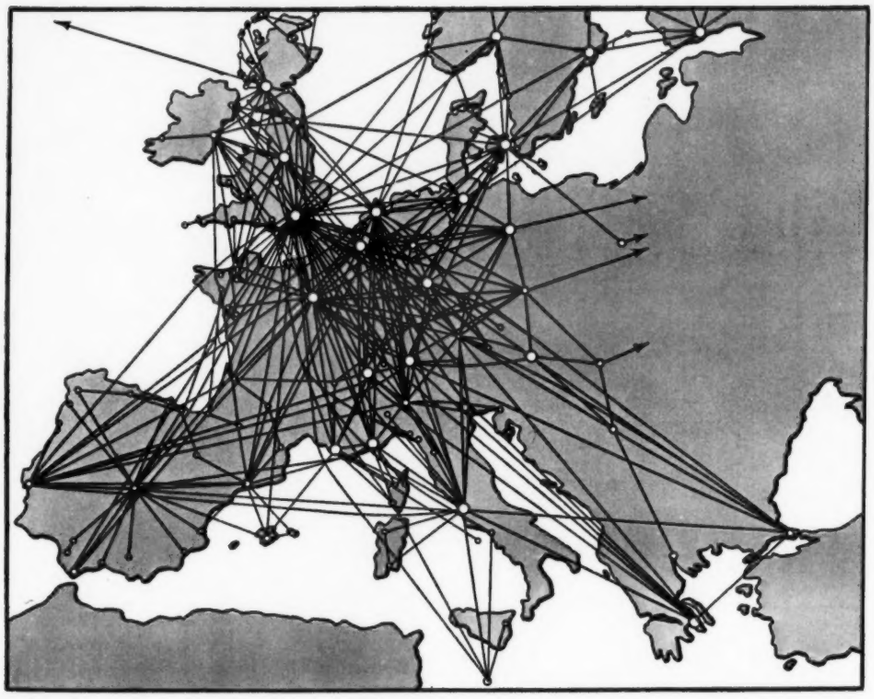
*

The *Domestic Trunk Airlines* in 1955 flew 29,978,000,000 available seat miles and 19,205,000,000 revenue passenger miles. In other words, the passenger load factor on the

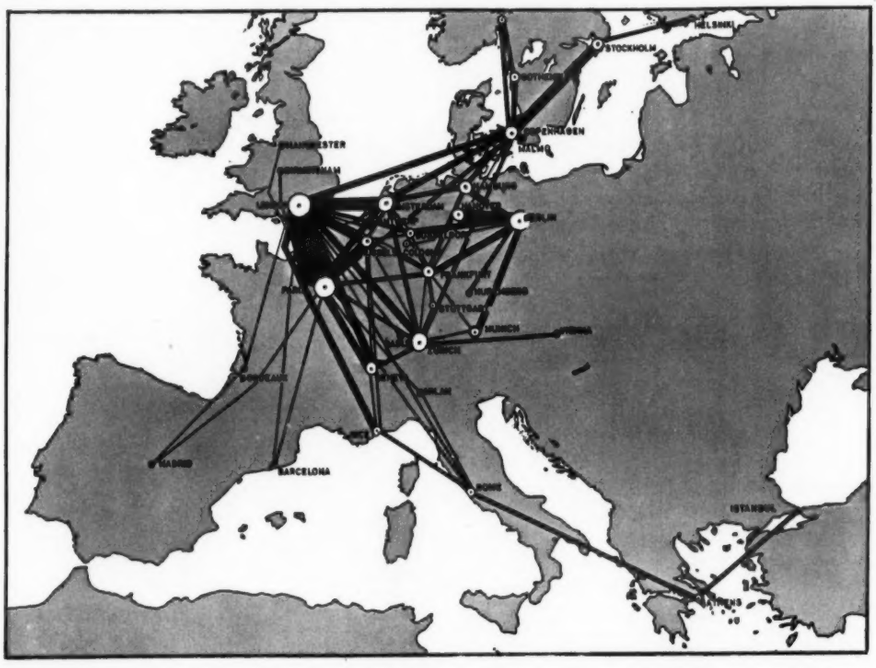
[1] "La Navigazione Aerea dal Punto di Vista Economico", by Carlo Rocca, published by Hoepli, Milan, 1930.
[2] A.T.A. figure.
[3] Founding companies of Air Research Bureau: Air France, B.E.A., K.L.M., Sabena, S.A.S., Swissair; A.R.B. was subsequently joined also by Alitalia, Deutsche Lufthansa, Aer Lingus.
[4] "Air Transport Facts and Figures", 17th Edition, 1956.

Some of the Leaders of World Air Transport

22. Swissair: Dr. Walter Berchtold, Managing Director; 23. T.A.I.: Paul Bernard, Chairman; 24. T.A.P.: Eng. D. Francisco de Mello o Castro, Chairman; 25. U.A.T.: Louis Vidal, Chairman and Managing Director; 26. A.A.: Cyrus R. Smith, President.



The entangled network of European air routes, resulting mainly from the rejection of cabotage. (From "The Economics of European Air Transport", by Stephen Wheatcroft, Manchester University Press, 1956.)



Lucrative routes with adequate passenger volume are limited to a relatively narrow, lenticular area in the West of the Continent, with three excrescences towards Stockholm, Berlin and Athens. (From "Intra-European Air Passenger Traffic, 1952 to 1954", by the Air Research Bureau.)

major domestic U.S. air routes was 64.06 percent. Since the break-even load factor in 1955 was 56.3 percent, these figures mean that *the U.S. domestic airlines must have made money.* Actually this was the case: the domestic scheduled airlines report a net profit of $ 63,101,000 (1954: $ 51,490,000). Incidentally, after surmounting the 1946-48 air transport slump, the U.S. domestic airlines reported no further losses in any of the subsequent years, as is shown in the table below:

Summary of Profit or Loss, U.S. Domestic Trunk Airlines
(Thousands of Dollars)

	Revenues	Expenses	Net Profit or Loss (after taxes)
1947	352,490	373,390	(20,242)
1948	413,353	411,278	(4,996)
1949	459,783	435,157	13,378
1950	524,109	461,538	30,879
1951	658,521	552,581	43,497
1952	768,015	672,892	53,534
1953	878,793	790,421	48,384
1954	978,214	878,758	51,490
1955	1,133,289	1,009,835	63,101

In parentheses: loss

In view of these results it is not surprising that officially the U.S. domestic airlines today operate without Government subsidy. In 1955 three companies still were dependent on subsidies—Colonial, Continental and Northeast—but following the merger of Colonial with Eastern Air Lines there will be only two lines drawing subsidies. Apart from that, a comparison of the total subsidy figure of $ 36,000,000 paid out by the Government with the income tax figure of $ 266,000,000 paid by the airlines shows that, on balance, the American taxpayer made a cool $ 230,000,000 out of the airlines.

Similar is the situation as regards *air mail.* In the early years of U.S. air transport mail payments from the Post Office Department formed the major source of revenue for the air carriers. Today the contribution of air mail payments to the total operating revenues has dropped to 4.2 percent. In 1955 the Post Office Department collected $ 142,571,000 in air mail postage and paid only $ 33,716,567 to the air carriers, which left the Government a surplus of no less than $ 108,851,433.

War on two fronts

By rights a "cash box report" of this nature should create a mood of unreserved enthusiasm among the American public. Far from it! The

27 28 29 30 31 32 33 34

27. C.P.A.L.: G. W. G. McConachie, President; 28. Delta: C. W. Woolman, President; 29. N.A.L.: George T. Baker, Chairman and President; 30. Northwest: Donald W. Nyrop, President; 31. P.A.W.A.: Juan T. Trippe, President; 32. Panagra: Andrew B. Shea, President; 33. T.C.A.: Gordon R. McGregor, President; 34. T.W.A.: Warren Lee Pierson, Chairman.

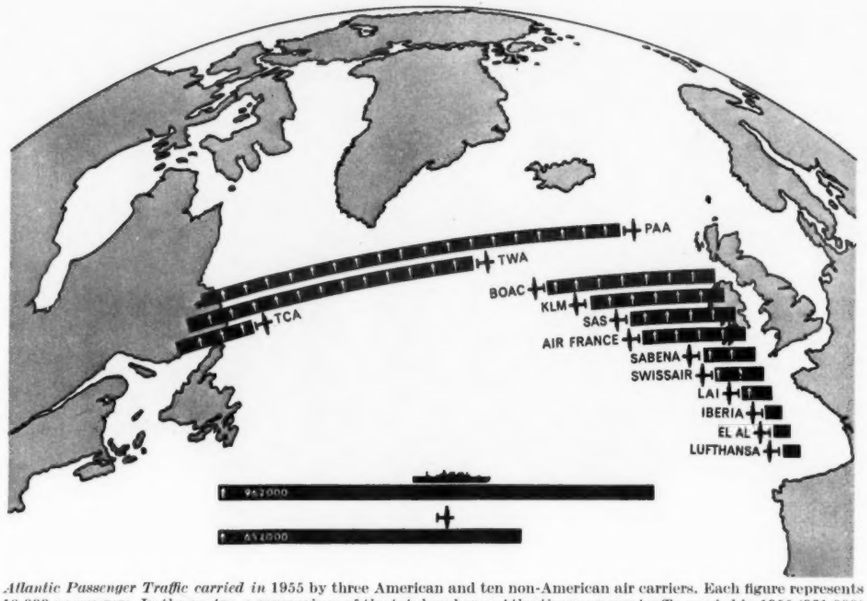
American John Doe scrutinizes his airlines with an extremely critical mien. What does he have to complain about?

In the past few weeks the air transport industry has had to defend itself against two diametrically opposed charges—some people said it is doing too well, others claim it is faring badly.

Too well? For months it has been asserted in the U.S. Congress that, as an industry of public utility, the airlines are making *excessive profits*. In spite of all cost increases in the form of higher wages and higher equipment prices the actual operating costs had dropped consistently. Hence it was high time for a drastic cut in *air fares*. Yielding to the pressure exerted by the parliamentarians, the Civil Aeronautics Board on June 12th initiated a general investigation of the industry's entire rate structure. What will emerge from this investigation the future will show. At any rate, the airlines gave as good as they got. On May 29th the President of the Air Transport Association, Stuart G. Tipton, told the Aviation Writers Association that during the past five-year period dividends paid out by the domestic trunk airlines amounted to about 28 percent of net profits after taxes, whereas the comparable figure for all U.S. corporations was nearly 54 percent. The U.S. airline industry had been consuming most of its own funds in order to provide better and expanded service.

A comparison of the airline industry's profit margin with those of other public utilities shows that the arguments of A.T.A.'s President are pertinent. In 1955 the airlines retained only 5.2 cents of each dollar of income as net profit, whereas the major railroads pocketed 9.2 cents out of each dollar and the electric power, gas and telephone companies as much as 13.4 cents. So far as the allegedly excessive air fares are concerned, the increases authorized over the past fifteen years are negligible. In 1941 a passenger mile on U.S. domestic trunk services cost 5.04 cents, in 1955 it cost 5.32 cents.

The *opposite reproach*—the airlines are living beyond their means—was raised in the press when in the second half of 1955 the U.S. air transport industry embarked upon the *most ambitious aircraft procurement programme of its history* by ordering 135 jet transport aircraft for $ 761,300,000; 135 propeller turbine transports for $ 265,000,000; 55 piston-engined aircraft for $ 137,300,000; as well as other aircraft of various categories, including helicopters, for $ 146,000,000.



Atlantic Passenger Traffic carried in 1955 by three American and ten non-American air carriers. Each figure represents 10,000 passengers. In the centre, a comparison of the total seaborne Atlantic passenger traffic carried in 1955 (961,000) with the Atlantic air passenger traffic (652,100). – Interavia Copyright.

"Fortune," the leading American monthly business magazine, acknowledged this programme by publishing a critical article significantly entitled "The Airlines' Flight from Reality." In contribution to the July 1956 issue of "Fortune" Cyrus R. Smith now explains "What the Airlines Expect from the 1961 Jet Fleet" which, incidentally, contains the prognostics quoted at the beginning of the present article.

Which seems to show that the U.S. air transport industry, armed with complete and detailed statistical records, can successfully wage a war on two fronts . . . There is nothing that can beat an efficient bookkeeping system.

European Problems

In his essay "Portrait of Europe" the Spanish author Madariaga compares Europe to a narrow street along which an endless column of motor cars (the nations of Europe) is painfully moving forward. Each driver curses the others, but none of them can muster even the slightest feeling of solidarity.

Well, European air transport can supply some frightening illustrations for Madariaga's criticism. One of the most drastic is contained in a most instructive economic study of the European airline system by Stephen Wheatcroft[5]:

[5] "The Economics of European Air Transport", by Stephen Wheatcroft, Manchester University Press, 1956.

Swissair operates a Zurich-London service, British European Airways flies a connecting service Manchester-London-Zurich. Since Swissair is unable to obtain an authorization to extend its London service to Manchester, because the British authorities reserve this internal cabotage traffic for their own airline, Swissair must open a new, direct service to Manchester. B.E.A., on the other hand, is also forced to inaugurate a direct Manchester-Zurich service in order to remain competitive. The result is that three Manchester services are operated instead of two, although this is not warranted by the available traffic volume.

The case quoted by Wheatcroft is no exception—it is the rule. There is no reason to be surprised at the wildly entangled route network on Europe's airline map and the worried expressions of the airline bosses.

Certainly, by their nature the European short-haul routes cannot be a sinecure. The average income of the European is far below that of the American, so that the European turns over each penny, centime or franc three times before he buys an airline ticket. However, Wheatcroft demonstrates in thirteen significant chapters of his book how all difficulties could fundamentally be overcome to a great extent, provided Europe's air transport could achieve a more rational utilization of its equipment and facilities and thus a reduction in specific costs and cut in fares. This is possible only if the Old

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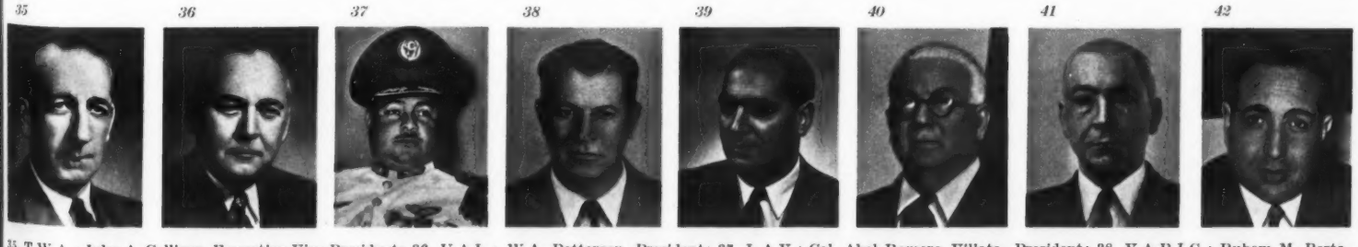

35. T.W.A.: John A. Collings, Executive Vice-President; 36. U.A.L.: W.A. Patterson, President; 37. L.A.V.: Col. Abel Romero Villate, President; 38. V.A.R.I.G.: Rubem M. Berta, President; 39. Air Algérie: Col. Jacques Soufflet, Exec. Director; 40. E.A.A.C.: Sir Alfred Vincent, Chairman; 41. E.A.A.C.: Col. M.C.P. Mostert, General Manager; 42. Misrair: Abdel Salaam Osman, Managing Director.

Zurich-Kloten Airport, passenger lobby.

World decides to dismantle the barbed-wire fences along its twenty-five frontiers, to conclude a liberal multilateral air transport agreement—what the Strasbourg air transport conference has done so far is entirely inadequate—and to create a balanced regional organization.

Today's situation of Europe's air transport industry is illustrated by a table compiled by the Air Research Bureau in which certain vital operating factors affecting the financial results of the A.R.B. member companies are compared to corresponding data pertaining to the U.S. domestic trunk airlines.

		A. R. B. Companies 1953	U.S. Domestic 1953
Operating Conditions			
Average frequency of service (weekly)		4.6	30.0
Utilization			
Average hours per day	Convair	5.7	6.3
	DC-6	7.5	9.0
Staff			
Productivity, in thousand tonne-kms per employee		19.5	54.9
Average annual earnings per employee, U.S. $		2,000 estimated	4,700
Costs			
Total cost per offered tonne-km, U.S. cents	Convair	36.0	23.1
	DC-6	30.0	18.3
Revenue rates			
Average passenger fare per km (U.S. Cents)		4.72	3.42
Average freight rate per tonne-km (U.S. Cents)		34.4	15.7

The figures in the above table are naturally not completely applicable to European air transport as a whole. It should not be overlooked that the Air Research Bureau member airlines belong to the most efficient of the European airline industry and operate the most lucrative routes of the intra-European network. If the statistics were extended to embrace all European air carriers, the figures for Europe would be in even sharper contrast to those for the U.S.A. It may be useful, in addition, to complete the above data with a comparison of the passenger load factors in American and European air transport:

Passenger Load Factors

	1951	1952	1953	1954	1955
U.S.A.	69.6	67.1	64.6	63.3	64.1
Europe (A.R.B. Companies)	59.5	57.9	57.4	53.6	58.5

As noted previously, Europe's airline industry, in order to become a paying proposition, must find ways and means of intensifying the use of its air fleet, reducing its costs and its rates. It would seem to be wise, however, carefully to synchronize all measures adopted towards this end and to proceed more systematically than, for example, during the introduction of tourist-class services in 1953. At that time tourist-class rates were simultaneously brought into force on all European routes without previous study of the required transport capacity. The consequence was that airline managements lived through several months of anxiety.

What are the means by which Wheatcroft proposes to cure the European air transport industry? To pick out but a few of his most significant suggestions:

- *Engineering:* a large aircraft type suitable for short-haul operations is required.
- *Economics:* no single European flag airline, as such a company would be too large; on the contrary, retention of the leading European air carriers which are large enough to be able to operate profitably; adoption of the principle of healthy competition practised by the U.S. Civil Aeronautics Board which authorizes competitive service on all the routes capable of "absorbing" more than one airline without unreasonable boosts in operating costs.
- *Ground organization:* Rigorous reduction in the number of airports, which is far too large at present (especially in view of the forthcoming inter-city helicopter services).
- *Political:* Creation of a regional organization of European air transport, consisting of a Government-level conference (a kind of permanent Strasbourg Conference and, under it, an air transport commission dealing with route planning, tariffs and statistics, and coordination) and an airline assembly with special bodies for research and planning as well as technical coordination.

Wheatcroft's projects make fascinating reading. An entirely different question is whether the nations of Europe are prepared, for the sake of air transportation, to renounce certain rights of sovereignty to which so far they have clung so stubbornly, like a starving miser to his case of gold.

Both Meet on the Atlantic

The relatively large amount of space this article has devoted to the internal air transport operations of both Continents fulfils the subsidiary purpose of explaining the atmosphere which prevails during business talks between representatives of European and U.S. airlines.

The burden which the Europeans are dragging around in the form of their unprofitable internal air services explains, for example, why European airline managements endeavour to maintain the existing high tariffs on the Atlantic routes and are not very enthusiastic about the fare cuts proposed by the Americans. For, even though the non-American share of

43 44 45 46 47 48 49 50

43. S.A.A.: D. H. C. du Plessis, General Manager; 44. S.A.A: J.D.T. Louw, Chief Airways Manager; 45. Air Ceylon: J. L. M. Fernando, Managing Director; 46. A.I.L.: J. R. D. Tata, Chairman; 47. A.I.L.: B. R. Patel, General Manager; 48. Air Liban: Basile Meguerdiche, Director-General; 49. Cyprus Airways: Dr. C. Raeburn, Chairman; 50. Garuda: Dr. M. Suteto, President-Director.

Passenger terminal at Paris-Orly.

the Atlantic passenger volume has to be split up among ten operators, the business is nevertheless profitable. And on the Atlantic the European airlines are "all there." Through strenuous efforts they have succeeded in whittling down the American share, which in the immediate post-war period amounted to nearly 70 percent, to about 53 percent.

Atlantic Passengers, 1955

U.S. and Canadian Operators

P.A.A.	187,104	(28.7%)
T.W.A.	127,222	(19.5%)
T.C.A.	34,267	(5.3%)
Total	348,593	(53.5%)

European Airlines and El Al

B.O.A.C.	73,804	(11.3%)
K.L.M.	58,012	(8.9%)
S.A.S.	46,261	(7.1%)
Air France	45,439	(7.0%)
Sabena	22,993	(3.5%)
Swissair	22,166	(3.4%)
L.A.I.	13,165	(2.0%)
Iberia	7,357	(1.1%)
El Al	7,325	(1.1%)
Lufthansa	7,013	(1.1%)
Total	303,535	(46.5%)

Here it should not be overlooked that in trans-Atlantic operations as well the Europeans are working with considerably lower passenger load factors than the Americans.

Atlantic Passenger Load Factors of American Operators

P.A.A.	67 %
T.W.A.	70.8%
T.C.A.	76.1%
Average	70.3%

Atlantic Passenger Load Factors of Non-American Operators

B.O.A.C.	63.7%
K.L.M.	60.7%
S.A.S.	63.2%
Air France	67.4%
Sabena	57.1%
Swissair	66.4%
L.A.I.	49.4%
Iberia	37,1%
El Al	56.8%
Lufthansa	40.9%
Average	56.3%

Thus it seems understandable that the European airlines did not feel very happy when P.A.A. and T.W.A. turned up at the I.A.T.A. Traffic Conference in Cannes last June with proposals to prune North Atlantic fares to rock bottom and, in addition to tourist-class services, to introduce a third-class operation with fares costing about half of present first-class services.

Well, after protracted haggling it was decided to adopt the new fares step by step.[6] For the London-New York service—which has been chosen as the yardstick for the North Atlantic rates—the following fares are now in force: first class, $ 440 single, $ 792 round-trip; tourist class, $ 290 single, $ 522 round-trip. Until April 1st, 1957, these basic fares will be retained, but cheaper special rates will come into force in the meantime. On April 1st, 1957, today's first class will be split up into two categories (luxury class and first class). The third-class fare to be introduced on the same date will be $ 232 single and $ 417.60 round-trip.

[6] This decision is subject to approval by the various governments.

*

While the Europeans go to these fare discussions under the psychological burden of their unsatisfactory short-haul operations, the Americans, for similar reasons, are horrified at the thought of granting European airlines lucrative traffic rights in the U.S.A., in return for which they might obtain reciprocal rights of dubious value in Europe.

In a report on "International Air Agreements" published on April 30th, 1956, the U.S. Senate's Committee on Interstate and Foreign Commerce voices very severe criticisms of the negotiating methods and the civil air policies practised by the U.S. State Department and the Civil Aeronautics Board. It more or less accuses the U.S. air transport negotiators of grossly neglecting American economic interests, of frivolously "bargaining away" the value of the U.S. market, and of inadmissibly excluding U.S. airline representatives from attendance at the bargaining table.

The Senate investigation was triggered by the public *malaise* over the stipulations of the U.S.-German bilateral air transport agreement of June 1955. But the Senate Committee extended its study to all European airlines operating to the U.S.A. and came to the conclusion that the passenger potential of none of the European countries represented a satisfactory equivalent to the potential offered by the big American cities. In future air talks, the Committee recommended, U.S. negotiators would have to keep an eye on this fact. In the middle of July 1956 the Senate Committee decided to act. It passed Bill which restricts the powers of the President of the U.S.A. in approving bilateral air transport agreements and submits the policies governing the conclusion of such agreements to direct Congressional control.

Perhaps the arguments of the U.S. Senators are pertinent. Nevertheless, this chapter of our air transport analysis shows—like the others—that in fashioning international air transportation too much room is still given to purely national interests. National chauvinism, however, has never been a very high-grade fuel.

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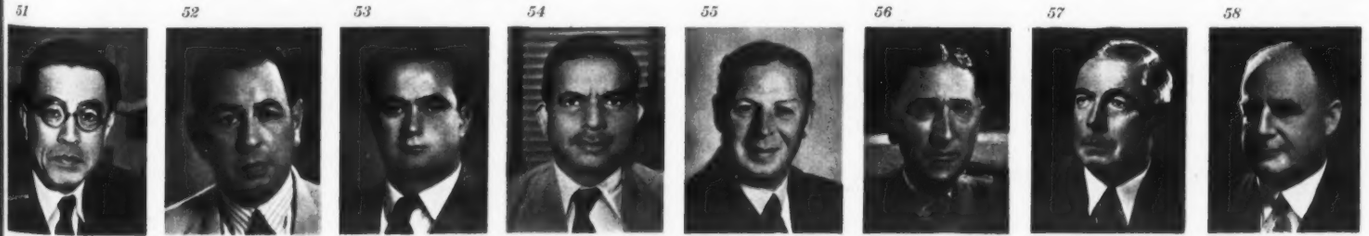


51. J.A.L.: Seijiro Yanagita, President; 52. M.A.L.: Capt. R.P. Mollard, Managing Director; 53. M.E.A.: Sheikh Najib Alamuddin, Managing Director; 54. P.I.A.: Zafarul Ahsan, General Manager; 55. A.N.A.: Sir Ivan Holyman, Chairman and Managing Director 56. Q.E.A.: Sir Hudson Fysh, Chairman; 57. T.E.A.L.: Sir Leonard Isitt, Chairman; 58. T.E.A.L.: G. N. Roberts, General Manager.

What's in the Air?

Extracts from Interavia Air Letter, *daily international news digest, in English, French and German. All rights reserved.*

A B-36 used as flying test bed for a reactor developed by the Convair Division of General Dynamics Corporation. The reactor is not used to power the aircraft, but is set in operation at high altitudes over uninhabited areas to investigate such problems as the effect of radiation on instruments, equipment and airframe, protection of the crew and the electronic installations from radioactivity.

AIR TRANSPORTATION

● **The reorganization of Greek air transport** is the subject of an agreement between the Greek Government and shipowner Aristoteles Onassis, giving the latter a 20-year licence to operate TAE Hellenic Airlines. For his part, Onassis undertakes to take over the whole of the airline's fleet and to run twelve regular domestic services and ten regular services to Central and Western Europe, the Middle East, South Africa and America. He also agrees to establish a big overhaul and maintenance factory in Greece for the servicing of Greek and foreign aircraft. He plans to buy three Douglas DC-7Cs and three Convair *Metropolitans,* and will start operating as soon as the transfer of equipment is complete. Onassis does not preclude the possibility of cooperating with a big airline. — It is estimated that the capital required to meet the commitments undertaken by the licensee will amount to $ 15,000,000. No financial assistance by the Government is provided, but a tax of 2.5 % will be paid by the company on gross profits.

Dr. Waloddi Weibull (left), prominent Swedish scientist and consultant to Svenska Aeroplan A.B., has been visiting U.S. aircraft centres. Picture shows him in conversation with D. D. Warner, Chief of Structures, Northrop Aircraft, Inc.

Signing the contract giving Société Bronzavia exclusive manufacturing rights in France and the French Union for the *Spraymat* de-icing system developed by D. Napier & Son. Left to right: M. de Fermor, President of Bronzavia; C. L. Cowdrey, Manager of Napier's Flight Development Establishment; M. Bruyneel, a Director of Bronzavia.

Italian Defence Minister Paolo Emilio Taviani on a visit to Supreme Headquarters, Allied Powers, Europe, in Paris, where he was received by Allied Supreme Commander General Gruenther (right) and his successor General Norstad (left).

● **K.L.M. Royal Dutch Airlines** has revised its articles of association in order to simplify the company's structure and facilitate its entry into the capital market. Under the new articles there will be priority shares and ordinary shares, a majority of which will be held by the Government. The present "A"priority shares, which may be held by the Government only, will be abolished, and the Government's position will henceforth be determined only by its majority in the share capital. All shares will have a nominal value of 100 guilders, making it possible to spread holdings among small investors. The company plans in due course to make a public shares issue. — K.L.M. also announces substantiel changes in its administration which has hitherto consisted of an eight-man Board of Directors and a Managing Board of six. The Managing Board's duties will in future be taken over by a management of at least three under the supervision of a Board of Directors of at least seven members. Members of the Board of Directors will be elected by the General Meeting of shareholders on a nomination made by holders of preference shares.

● **Italian interest in the Comet IV** is reported by *Interavia's* Rome correspondent. Although the proposed legislation, which would provide credits totalling 40,000,000,000 lire for the purchase of jet airliners by L.A.I. and Alitalia, is still being studied by the ministries concerned, it is believed in Rome financial circles that both companies would do better if they ordered British *Comet IV's* rather than American Boeing 707s or Douglas DC-8s. It is pointed out that Italy has substantial credits in Britain which would facilitate the purchase of *Comets* and that the British aircraft could be delivered more quickly, since de Havilland is not so tied down with orders as the two American manufacturers.

● **Linee Aeree Italiane** has obtained a $ 6,200,000 credit from the Export-Import Bank to help finance the purchase of airliners from Lockheed Aircraft

The first KC-135 jet tanker leaving Boeing Airplane Company's Transport Division plant at Renton, Washington. Left, the 888th and last KC-97 piston-engine tanker.

Short Brothers & Harland Ltd., which is producing the *Seamew* anti-submarine aircraft (left), recently received a visit from N.A.T.O. representatives. Left to right: Rear Admiral Sir Matthews S. Slattery, Chairman and Managing Director; Capitaine de Frégate de Rodellec de Porzic, of the French Navy; Lord Ismay, Secretary General and Vice-Chairman of the North Atlantic Council; J. Lankester Parker, a Director of Short Brothers; Commander Lamiman, U.S. Navy; Sir Christopher Steel; and Captain St. John Fancourt, Personal Assistant to Sir Matthew Slattery.

Corporation. L.A.I. has four Lockheed L-1649 A *Super Constellations* on order, which will be used on non-stop flights between Rome and New York.

• **Air France** reports that sales last year increased by 12.4% to 52,000.000.000 francs. The number of passenger-kilometres performed rose 13% from 2,000,000,000 in 1954 to 2,350,000,000 in 1955. Load factor averaged 71%. Following the delivery of four Lockheed L-1049G *Super Constellations,* the company hopes to improve the relationship between capacity offered and demand.

INDUSTRY

• **A technical collaboration agreement** has been concluded between Société Anonyme Belge de Constructions Aéronautiques (SABCA) and S.N.C.A. du Sud-Ouest. In addition to production by SABCA of parts for the SO.4050 *Vautour,* the agreement also provides for collaboration in the manufacture of all aircraft ordered from SNCASO by the French Government or overseas customers. The two companies expect to extend this cooperation to new developments within the framework of the Association Internationale des Constructeurs de Matériel Aéronautique.

• **New Managing Director of the Istituto per la Ricostruzione Industriale** is Dr. Salvino Sernesi, who succeeds Dr. Ferrari. Dr. Sernesi is President of the Italia Shipping Co. and former Managing Director of the Italian Broadcasting Company. His election will doubtless have a great effect on the dispute between the Merchant Navy and civil aviation about the reorganization of Società Finanziaria Marittima (which belongs to I.R.I. and controls the major shipping companies) into Società Finanziaria della Navigazione, which is to control the airlines as well.

• **A prototype programme** submitted to Defence Minister Paolo Emilio Taviani by the Italian Air Staff has been approved by the Air Section of the Supreme Armed Forces Council. It provides for the Defence Ministry to contribute funds to the following prototypes for the Air Force: Aer-Macchi B.326 basic jet trainer; Piaggio 155 amphibian for sea rescue duties, with one version for anti-submarine work; a guided missile built by Industrie Meccaniche Aeronautiche Meridionali Aerfer; X-1 helicopter for 14 to 16 persons, designed by Engineer Filippo Zappata and built by Costruzioni Aeronautiche Giovanni Agusta; and a high-speed military transport, type designation not given (*Interavia's* Rome correspondent understands, however, that it is the Piaggio 153).

• **Ramo-Wooldridge Corporation,** Los Angeles, is acting as engineering and scientific supervisors of the U.S. Air Force Ballistic Missile Programme. The Air Force is known to be developing two intercontinental ballistic missiles, *Atlas* and *Titan,* as well as an intermediate range ballistic missile known as *Thor.* The company's technical direction responsibilities are carried out in its Guided Missile Research Division, which functions as part of a three-member team including Air Materiel Command's Western Development Division and Ballistic Missiles Office.

• **Curtiss-Wright Corporation** has concluded an agreement with Studebaker-Packard Corp. on the long-term lease of the latter's plants at Utica, near Detroit, and South Bend, Indiana. Curtiss-Wright will pay Studebaker-Packard $ 35,000,000. The payment will also cover the outright purchase of the Studebaker-Packard Aerophysics Development Corp., of Santa Barbara, California, and the purchase of certain undisclosed defence assets. Curtiss-Wright also acquired an option to buy 5,000,000 shares of unissued Studebaker-Packard stock at $ 5 a share.

• **The Garrett Corporation,** Los Angeles, is opening a European office in Geneva, Switzerland. It is to be headed by Bryan Sandford Clark, hitherto Sales Manager for Rotol Ltd., England.

• **Hindustan Aircraft Ltd.** is awaiting final authority to launch two major projects: the production line for the Folland *Gnat* and the building of a new factory to manufacture the Bristol *Orpheus* jet engine. At present the H.A.L. plant is busy with regular production of HT-2 trainers and with a small production line of *Vampire* trainers.

AIRCRAFT

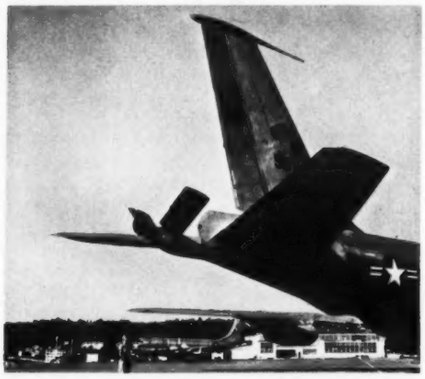
• The *Fouga CM.170-M* naval trainer prototype began flight testing at Toulouse-Blagnac under Chief Test Pilot M. Grangette on July 31st. The trainer, a version of the CM.170-R *Magister* adapted to Navy requirements, is fitted with two Turboméca *Marboré* jet engines and is suitable for catapult take-offs and deck landings (arrestor hook, etc.).

• The *Dassault Etendard II* light ground attack aircraft began flight testing at Melun-Villaroche on July 23rd. It is powered by two Turboméca *Gabizo* jets. — Less than 24 hours later the *Etendard IV* (one SNECMA-Atar E jet) also made its first flight, at Bordeaux-Mérignac.

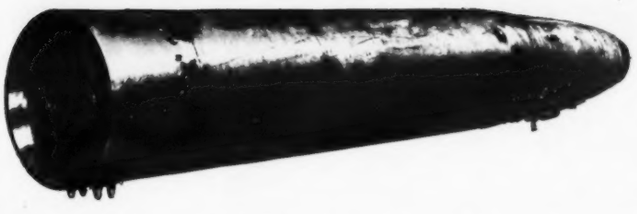
A *Nike* launching base of 740th Anti-Aircraft Battalion at Fort Winfield Scott.

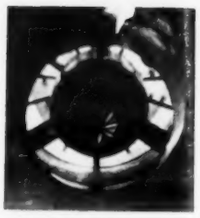
Characteristic tail forms of American military aircraft: Chance Vought F8U-1 *Crusader* with enlarged rudder unit and all-flying tailplane. The *Crusader* is powered by a Pratt & Whitney J-57-P-4 turbojet with afterburner.

Douglas F4D-1 *Skayray*, a delta fighter for carrier-based operation, has two-piece rudder, but no horizontal tailplane. The wing root fillets shown in the picture are movable.



Rear of the first Boeing KC-135 four-jet tanker with conventional tail (variable-incidence tailplane) and fuelling hose in raised position.





Bristol *Thor* ramjet for guided missiles and aircraft. Length 8 ft., intake diameter 9 ins., efflux diameter 15.5 ins. So far more than 200 experimental vehicles equipped with *Thor* have been flight tested. Picture shows the intake apperture during a test.

• The second prototype of the *CASA 207 Azor* twin-engine medium-haul commercial transport built by the Spanish firm of Construcciones Aeronáuticas S.A. has also begun flight testing.

• The first *Bristol Britannia series 300* made its first flight at Filton on July 31st, and the first *Vickers Viscount 802* on July 27th. The latter is the first 800 series to fly and the first of the 24 802s ordered by B.E.A.

• On July 25th the *Bell X-2* rocket research aircraft reached the record speed of approx. 1,900 m.p.h. near Edwards Air Force Base, California. The aircraft was piloted by Lieutenant Colonel Frank Everest, chief of test flying at Edwards.

• *Cessna Aircraft Co.* plans to produce the four-seat CH-1 helicopter in substantial numbers for the civilian market, with the first models becoming available in 1958. A military version, the YH-41, has been ordered in limited numbers; the first will be delivered in August 1957.

ROCKETS AND GUIDED MISSILES

• Small spin-stabilizing rockets, placed at the rear of the body, will be used to hold the *Vanguard three-stage satellite* in the correct "attitude" once it leaves the earth's atmosphere, it is announced by the U.S. Navy and The Glenn L. Martin Co. A development contract for these rockets has been awarded by Glenn L. Martin (main contractor for the *Vanguard* project) to Atlantic Research Corporation, of Alexandria, Virginia.

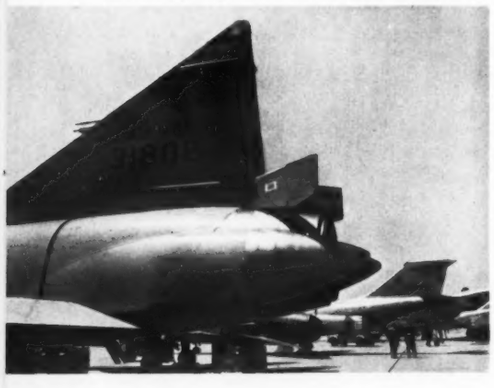
• A new *research rocket*, known as *Dan*, is being tested at White Sands Proving Ground, New Mexico. It is a two-stage vehicle using solid propellants.

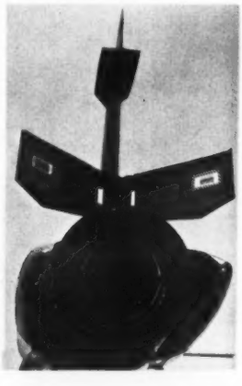
• The U.S. Navy has awarded a $ 12,000,000 contract for production of *Chance Vought Regulus II* guided missiles. This follows recent announcement of an additional $ 14,000,000 contract for *Regulus Is*. The new version is superior in performance to its predecessor, though it can be fired from the same ramps.

• Two new experimental missiles, the X-7 and X-17, developed by the Missile System Division of Lockheed Aircraft Corporation in connection with the I.C.B.M. programme are announced. The X-7 is a pilotless test vehicle with straight thin wing and straight single tail unit, powered by a Marquardt ramjet engine. It is carried to the desired test altitude by a B-29 bomber. The initial speed required for reliable operation of the ramjet is provided by a booster rocket. The X-7 is used for testing ramjets and parts for guided missiles. A parachute permits recovery of the vehicle after completion of its mission. — The X-17 is a test vehicle with rocket motor, which is used for testing structural materials and determining the optimum shapes for I.C.B.M. warheads. — *North American X-10* is the designation of another test vehicle designed primarily for aerodynamic measurements and testing electronic components for guided missiles, in particular the North American *Navaho*.

Boeing B-52 *Stratofortress* eight-jet heavy bomber with strikingly small one-piece rudder, normal elevator unit with variable-incidence tailplane and one-piece elevator.

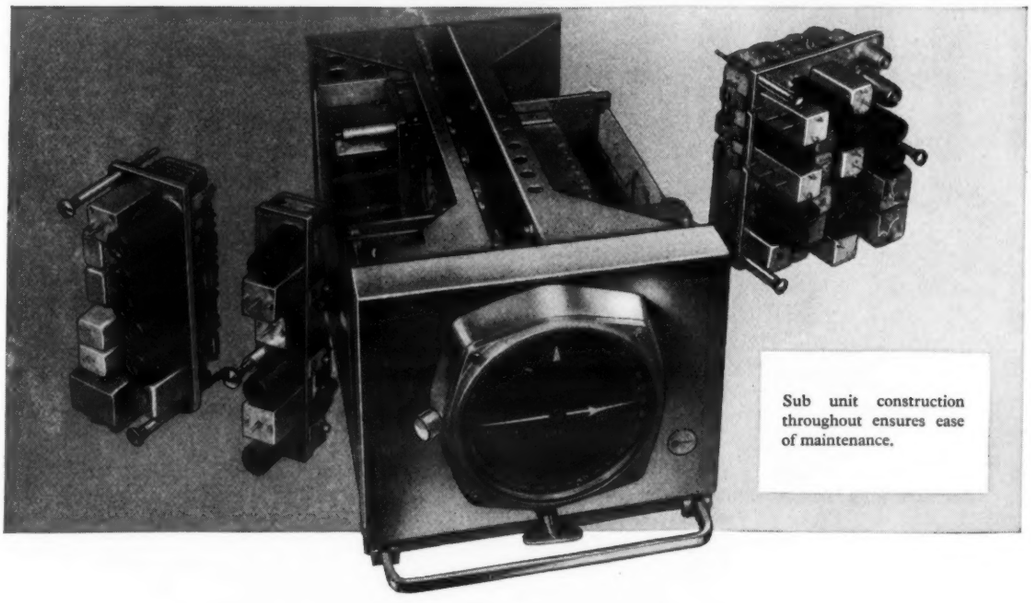
Convair F-102A delta fighter with Pratt & Whitney J-57 turbojet and afterburner. Above the jet pipe are the dive brakes, which also enclose the landing parachute.





The sharply swept tail unit of the McDonnell F3H-2N *Demon* carrier-based fighter has an all-flying tail. One of the two dive brakes can be seen on the side of the fuselage.

Marconi's NEW Pilot Operated
AUTOMATIC DIRECTION FINDER



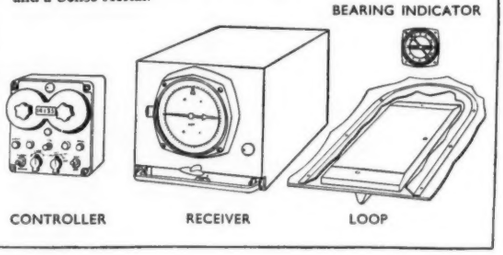
Sub unit construction throughout ensures ease of maintenance.

Type AD712 provides automatic or manual direction finding, radio range and Consol reception

- **Crystal controlled automatic tuning**
- **Decade frequency selection in 0.5 kc/s steps**
- **Fixed Loop system with no moving parts**
- **Electrical Quadrantal Error correction of up to 25°**
- **Up to 60 feet of sense aerial feeder and 50 feet of loop aerial feeder**
- **Sense aerial of only 5 hi caps required**
- **Sensitivity of 25μ V/m for a bearing accuracy of ±2° (including QE)**

More than forty Airlines and twenty Air Forces fit Marconi air radio equipment. Marconi airport installations are in use throughout the world.

The entire system comprises Controller, Receiver, Loop, QE Corrector, one or more Bearing Indicators and a Sense Aerial.



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Airport and Aircraft Radio Systems

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, CHELMSFORD, ESSEX
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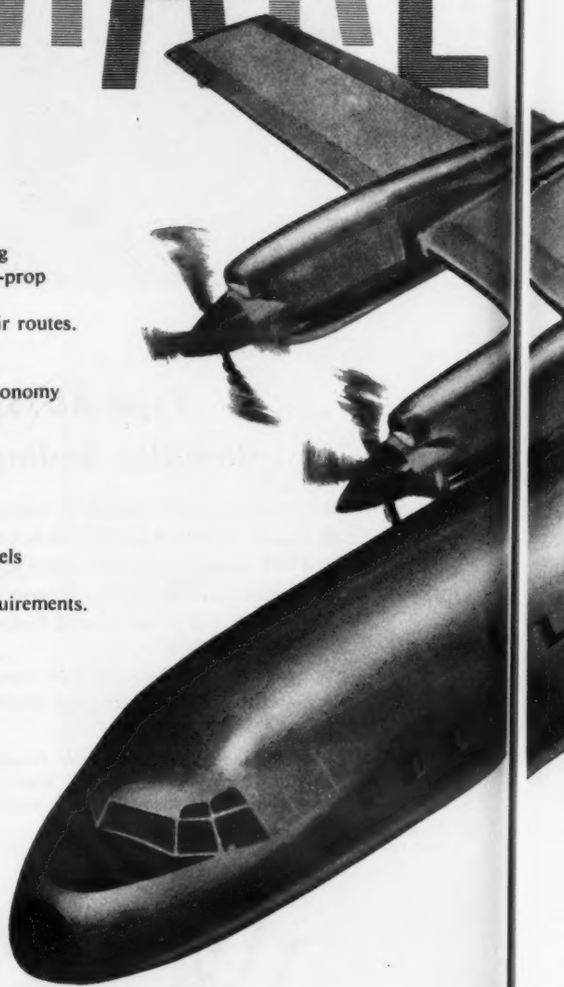
MONEYMAKE



Lockheed, long famous with airlines throughout the world for producing moneymakers, now offers the all-new Turbo-prop Lockheed Electra. The Electra fulfills the airlines' growing need for transports that can operate economically over the majority of the world's air routes.

MONEYMAKING AND MONEYSAVING FEATURES

- Range Flexibility - 100 to 3,000 mile distances flown with unequalled economy from large and small airports . . . minimizes fleet requirements.
- Cruising speeds 60 miles per hour faster than any Turbo-prop airliner now flying.
- Unsurpassed styling, comfort, luxury and spaciousness for all classes of airline traffic.
- 30 percent lower fuel costs than latest piston-engine airliners due to aerodynamic cleanness of the Electra and relatively inexpensive fuels required for turbine-powered aircraft.
- Design innovations which minimize ground handling and maintenance requirements. This shortens groundtime for faster schedules.

The Lockheed Electra means faster flight schedules, greater utilization and increased profits.

LOCKHEED ELECTRA

129 ELECTRAS *have been ordered by American Airlines / Braniff International Airways / Eastern Air Lines KLM Royal Dutch Airlines / National Airlines / Western Air Lines.*

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Air Navigation and Approach Aids in the U.K.

By E. J. DICKIE, M.B.E., A.R.Ae.S., M.I.N.,
Deputy Director (Development), Control and Navigation,
and J.L. C. BRISCOE, D.F.C.,
Deputy Director, Aerodromes Technical,
Ministry of Transport and Civil Aviation, London.

It is well known that for many years the U.K. has advocated the adoption of an " area fixing " system for *medium and short distance air navigation*. Two such systems are currently in use in the U.K., the Gee system, of war-time fame, which is still extensively used by the R.A.F., and the Decca system which provides navigational assistance to aircraft and ships alike.

The U.K. still holds firmly to the view that this type of navigation aid, which is capable of providing " fix " information continuously, is the most suitable system to employ from the points of view both of the aircraft operator and the air traffic control authority.

One of the major problems of the A.T.C. authorities is the siting, installation and maintenance of radio beacons of various kinds which have to be located more or less on the centre line of the airways, at every junction and turning point and at suitable intervals along the route. All this takes a great deal of time, effort and money, and once the airways have been established they tend to become all too rigid. In contrast to this, route changes can be effected with the greatest of ease and with the minimum of expense if aircraft are using an " area fixing " type of air navigation aid.

Reference should be made now to fixing accuracy. Obviously it is necessary for the navigational aid to be sufficiently accurate to enable the pilot to remain within the conventional 10 mile wide airway and to be able to determine position along track with an accuracy compatible with the longitudinal separation standards employed by A.T.C. Clearly, too, as traffic density grows, it will become necessary for separation standards to be reduced. Also, as a result of the introduction of the high flying jet engined aircraft, the clearance of aircraft up and down through occupied altitudes has become one of the major problems confronting the A.T.C. officer. If navigational tracking accuracy will permit aircraft to maintain safe lateral separation of some 5 miles, then two " one-way " tracks could be established within a 10-mile airway and the control of opposite direction traffic greatly simplified.

A reduction in longitudinal separation is not so easily achieved. Velocities are not only very high but are also variable, so that longitudinal separation standards must take into account air-to-ground position reporting, A.T.C. display equipment, time estimates and so on. But the long term objective remains self-navigation by aircraft and " self-help " by control. In other words, pilots should be able to find their way about the sky with an accuracy high enough to enable A.T.C. to plan the traffic flow on standard separations substantially lower than those currently employed. Similarly, A.T.C. should have the means—such as radar can provide—of keeping the traffic situation constantly under review without having to depend on air-to-ground " position reports ". With this combination a situation can be envisaged where traffic can flow smoothly with the minimum of air/ground/air communication.

Although more than 10 years of practical experience have convinced the authorities in the U.K. that their reasoning is sound, it is fully realised that if an efficient A.T.C. service is to be provided for international aviation, due account must be taken of the navigation equipment which the airlines of the world elect, for better or worse, to use. Thus the present U.K. airways system is based on MF radio ranges, non-directional beacons and fan markers; VOR beacons are in the process of being installed.

*

For long distance world-wide operations the U.K. considers that self-contained airborne navigation aids have much to commend them, and it is hoped that British equipment of this kind will become available before too long. *Navigation across the North Atlantic* falls into a special class of its own since the whole of the North Atlantic is a Control Area. This means that traffic separation has to be provided by an A.T.C. organisation which in turn has to depend on air-derived position reports on which to base A.T.C. clearances. With the next generation of aircraft all requiring more or less the same optimum flight altitudes, it will become increasingly important, if this type of A.T.C. service is to continue to function, to rely on lateral rather than longitudinal separation. This means providing a navigation aid which will readily permit aircraft accurately to adhere to predetermined tracks, laterally separated, and the Dectra system, trials with which are due to begin early next year, promises to fulfil the need.

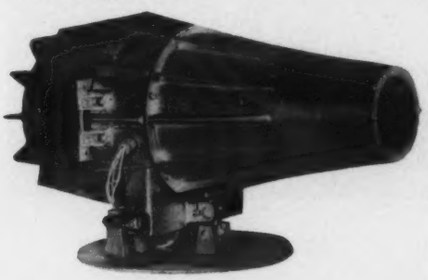
*

The United Kingdom is tackling the problem of *aids to final approach* from two angles. Firstly, the provision of better daylight runway markings and the lighting of runways and, secondly, the provision of a combination of the best radio facilities.

In order to see how best to improve the visual aids to approach, with the particular aim of reducing risk of aircraft under-shooting the runway, experiments were carried out recently at Blackbushe Airport with various novel forms of lighting and runway marking. These were concentrated mainly at a point 1,000 feet in from the threshold in the belief that by providing an additional reference point beyond the normal threshold indications, pilots would be able to form a better judgment of their height by observing the relative amount of movement of the two markings and would at the same time be encouraged to select a touchdown point nearer the instrument reference point.

To provide pilots with a more precise visual check on the accuracy of their descent path, two new high-powered angle of approach indicators were also provided. These indicators give the conventional red/green/amber signal, but are of considerably greater power and, with a narrower beam, give a more sensitive signal. They are visible in most daylight conditions as well as at night. The indicators were installed on either side of the runway at the end of the black and white painted boards.

The G.E.C. Angle of Approach Indicator shows the pilot by means of red, green and amber lights the angle at which he is approaching touchdown point. To make the beams more discernible, an arrangement for flashing the colours has been incorporated.



The United Kingdom is planning to incorporate the main features of these two experimental layouts into the standard lighting for all the main runways at its aerodromes.

The U.K. policy on radio and radar aids to final approach is to provide the I.C.A.O. standard ILS on the main instrument runways at all major airports. Radar surveillance equipment is also being provided for A.T.C. purposes at a number of civil airports with precision approach radar on a more limited scale. SBA is still available at certain aerodromes but is now rapidly becoming redundant and is in the process of being withdrawn from service.

Since London Airport was opened, extensive use had been made of radar marshalling and " talkdown " techniques, and the pilots of aircraft of many nations make much use of these facilities. The former, the use of radar surveillance equipment for marshalling aircraft on to the final approach path, is in fact obligatory under IFR and, by popular consent, is becoming the rule rather than the exception even in visual meteorological conditions.

The landing rate at London Airport, under IFR, has now just about reached the maximum possible with talkdown procedures operated over a single R/T channel, and if landing rates up to the maximum possible with the existing and next generation of aircraft are to be regularly achieved, pilots will have to depend more on " self-help " and less on radar talkdown. It is confidently expected that the introduction of airborne equipment of the " auto coupler " type will do much to simplify ILS approaches, leaving PAR to exercise more of a monitoring than a direct control function. The Ministry of Transport and Civil Aviation, however, has not ruled out the possible alternative of increasing PAR control capacity by the provision of an additional R/T channel and sharing the load between two PAR controllers working side by side.

One evil remains which it is beyond the power of the aerodrome and A.T.C. authorities to remedy. So long as aircraft approach speeds are high and a common approach speed for all aircraft is not possible, time will always be wasted whenever a slow aircraft follows a faster one down the approach path. The minimum safe separation must be applied during the initial phase of the approach and will inevitably widen before the second aircraft touches down. If really high landing rates are to be achieved with perfect safety, then not only must all the aircraft approach at the same speed but this speed must also be low. If aircraft could all approach at 60 knots (and behave more like road vehicles than projectiles from the moment they touched down), then a landing rate of 60 per hour could be maintained on a single runway, each pilot having plenty of time to settle down on the approach with a mile separation from the aircraft in front and behind. But perhaps, for the peace of mind of the apron and passenger handling staffs. it is as well that such landing rates cannot be maintained at international airports in all weathers at the present time!

LONDON AIRPORT

BY INTERAVIA'S LONDON EDITOR D.W.

Fig. 1: The 2,060-ft. tunnel leading from the Bath Road to the Central Terminal Area.

Introduction

by Air Marshal Sir John d'Albiac, K.B.E., B.B., D.S.O.

I am grateful to **Interavia** for the opportunity to introduce the first of a series of reviews of major international airports.

This account of the development of London Airport comes at a most appropriate time. The official opening of the new buildings in the Central Area by Her Majesty The Queen on the 16th December last, marked the conclusion of the first phase of the construction of the permanent London Airport.

Ten years ago, when civil operations first started at what was then called Heathrow, London Airport had three runways, and passenger facilities were provided in a heterogeneous collection of marquees, caravans and huts. During the summer of 1946, some 8,000 passengers passed through the Airport each month.

Now, any single day often brings a passenger flow of over 12,000, and we have reached the stage where most of our European and domestic flights are dealt with in the new passenger building of London Airport Central. Planning of further permanent buildings for the Central Area to accommodate the long haul traffic is now in an advanced stage.

Not only in the passenger field is this rapid expansion taking place; in ten years our monthly average tonnages for freight and mail have leapt from a mere 273 to over 4,000. Whilst our plans for the development of passenger facilities are well advanced, we are not losing sight of the need to provide equally efficient arrangements for the handling of freight, and I look forward with keen anticipation to the time when all of our rapidly expanding traffic can be found permanent accommodation.

London Airport bids fair to be the busiest airfield in the world in the years to come. Last year some 2 ¾ million passengers were handled, and by 1960 it is expected that this figure will have risen to 5 million. Already London Airport is the busiest in Europe and has the greatest number of scheduled airlines operating from it — 32 (Idlewild is second with 19 and Rome third with 17).

Its six runways are long enough and strong enough to serve any likely aircraft including the new American jets, and with the parallel runway system a peak flow of 60 aircraft movements per hour should be possible in reasonable weather.

Planning and Construction

In September 1945 an advisory layout panel was set up to recommend the civil layout for the airport within a given area. The panel after much deliberation finally adopted a triple parallel runway system, a central area for the permanent terminal buildings and three perimeter maintenance areas (see *Fig. 2*).

The actual work accomplished to complete the airport can be divided up as follows :— 1. site preparation and actual airfield construction : 2. building of a temporary terminal now called London Airport North ; 3. construction of the maintenance areas, and 4. the completion of permanent buildings at London Airport Central.

The runways were finished by 1950 and the first two maintenance areas (No. 1, east, for B.O.A.C. and B.E.A. and No. 2, south east, for foreign and British independent operators) are now in use. First phase of the permanent building construction was completed December last when Her Majesty the Queen inaugurated the Control building, the South East face passenger building and the eastern apex building *(Fig. 2)* adjacent to it.

Actual construction of London Airport represents one of Britain's largest post-war civil engineering projects. Some idea of its magnitude can be gained from the fact that two rivers had to be diverted into special channels round the airport, and disused gravel pits filled in, entailing the excavation of ten million cubic yards of earth. The principal runways and taxiways were paved with 12 in. thick concrete over an eight inch concrete sub-raft. It is claimed that the concrete used at London Airport would make a 20 ft. wide road stretching the 330 miles from London to Edinburgh.

One of the most outstanding features of the general construction work is the tunnel which connects the Bath Road out of London with the central terminal buildings *(Fig. 1)*. This runs under the original No. 1 runway in a reinforced concrete shell 2,060 ft. long, 86 ft. wide and 23 ft. high with dual two lane carriageways for motor traffic and two separate cycle tracks and pedestrian paths. Fluorescent lighting in the tunnel is graded to prevent a sudden change of intensity on entering or leaving, and fresh air is fan circulated.

Fig. 2: Aerial view of London Airport. 1 – Road tunnel; 2 – control building; 3 – South-east passenger handling building; 4 – Queens Building; 5 – B.E.A. hangar; 6 – B.O.A.C. hangar.

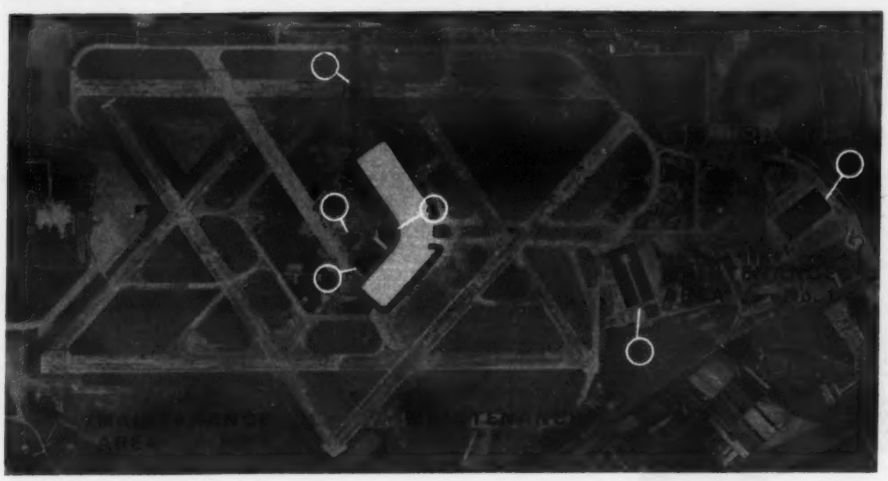


Fig. 3: Concourse in the passenger handling building: left foreground, two escalators (and two fixed stairways) for passengers; behind, the conveyor belts.

Central Terminal Area

The Central Terminal Area covers 178 acres, of which 52 acres are reserved for buildings. Present plans provide for four aprons and four main buildings—the Queens Building, two passenger handling buildings, and the Control Building.

So far two aprons (on the North East and South East faces) have been built providing 34 aircraft stands *(Fig. 5)*, and a third on the South West face is nearly completed with a further 19 stands.

In the passenger handling building, incoming and outgoing passengers go through Customs, health and immigration formalities. The passengers arriving by airline bus, or other means, are conveyed by escalator to the first floor, where they pass along one of ten passenger-handling channels. These channels run through transverse halls devoted successively to the concourse *(Fig. 3)*, customs, immigration, health and waiting rooms. Meanwhile, the passengers' luggage travels on conveyor belts through the ground floor, coming up to the first floor only as it crosses the Customs Hall. In this way, passenger formalities are cut to the minimum—an obvious advantage, since ground handling is sometimes the limiting factor to the possible number of aircraft movements. Each channel is completely reversible and, since inward and outward traffic peaks seldom coincide, this means that fewer channels are needed and a greater economy is achieved. Transit passengers have their own self-contained suite on the air side of the Customs barrier, which stretches the whole length of the building. The suite includes buffet-lounge, restaurant, shops, cable offices and a small nursery.

The Queens Building has two main purposes —the handling of aircraft operations, including aircraft and crew clearance, load control, meteorological forecasting, flight planning and crew briefing; and amenities for the general public—a Post Office, News Cinema, Grill Room and Buffet, and access to the roof gardens of all the buildings in the central area.

The Airport Control Building in the centre has an all-round view of runway approaches and taxiways, and its control tower is 127 ft. 6 in. high. It contains the airport management headquarters, telecommunications, the medical centre, restaurant and welfare facilities for the central area staff. Local control is undertaken from the aerodrome control room situated in a glazed penthouse in the roof. Below this is the approach control room with a 15 ft. high ceiling.

Landing and navigational aids are very comprehensive, and include microwave early warning (MEW); full G.C.A.; ILS with a Pye localiser; Marconi airfield control radar type S.232 and S.13 height finder; Cossor A.C.R. Mk. 6 (as at Zurich-Kloten) and the unique Decca Q-band Air Surface Movement Indicator (cf. *Interavia* No. 2/1956). The London Airport approach lighting system is claimed to be one of the best and simplest in the world, and was developed by the Works Directorate of the Air Ministry from a basic design by the R.A.E. It is the line and bar, or Calvert system, with a centreline of white lights 3,000 ft. long and yellow light cross bars at intervals of 500 ft. for poor visibility conditions. For good visibility the system uses red low intensity lights overall. From the pattern and arrangement of lights the pilot can tell whether his approach is banked or laterally displaced.

Aircraft taxying at night are guided along the taxiways and runways by following green lights sunk into the centre of the runways and operated from the Control Tower. The runways are divided into "blocks" with controllable "stop" bars of red lights at the end of each block. By day, the route to be followed by taxying aircraft is indicated by lights on numbered boards.

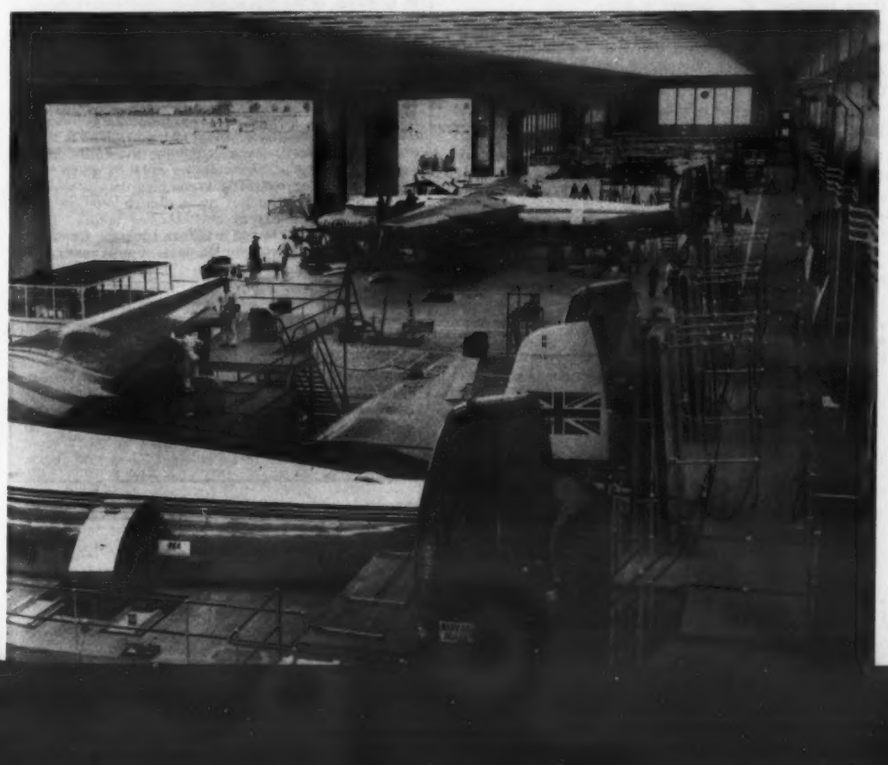
The installation of F.I.D.O. (Fog Dispersal) at London Airport was discussed by the operators, who were asked if they would be prepared to contribute to its cost. The majority were not in favour and preferred to continue with the present arrangements of weather minima and diversion when the weather is too bad and London Airport has to "shut down".

Fig. 5: The south-east passenger handling building with part of the crescent-shaped apron for 34 aircraft. Picture also shows two of the planned eight passenger bridges with forked ramps. In the background the 128-ft. control tower.

Scheduled Airlines Operating from London Airport

Aer Lingus
Aerolineas Argentinas
Air Ceylon
Air France
Air India International
Airwork Ltd.
Alitalia
BKS Air Transport Ltd.
British European Airways Corporation
British Overseas Airways Corporation
Central African Airways
El Al Israel Airlines
Finnair Aero O/Y
Hunting Clan Air Transport
Iberia Spanish Airlines
Iceland Airways
J.A.T. Jugoslovenski Aerotransport
K.L.M. Royal Dutch Airlines
Lufthansa German Airlines
Pakistan International Airlines
Pan American World Airways
Panair do Brasil
Qantas Empire Airways
Sabena
Scandinavian Airlines System
South African Airways
Starways, Ltd.
Swissair
TAE Greek National Airlines
Transportes Aereos Portugueses
Trans-Canada Air Lines
Trans World Airlines

Fig. 4: B.E.A.'s U-shaped maintenance building at London Airport (No. 1 Maintenance Area) has two rows of five pens each 180 ft. wide for the airline's *Elizabethans* (Airspeed *Ambassador*; foreground) and *Viscounts*.



Maintenance Areas

No. 1 Maintenance Area contains B.E.A.'s new engineering base, B.O.A.C. headquarters building and eight temporary hangars mainly used by B.O.A.C.

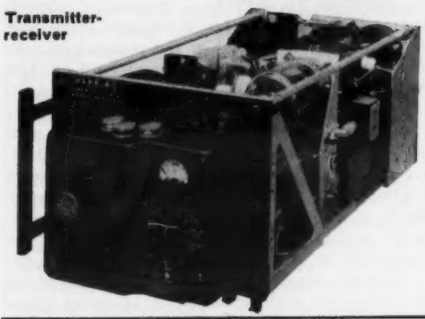
B.E.A.'s base is a U-shaped building containing two rows of five pens, each of 180 ft. span, for the maintenance of the *Viscount* and *Elizabethan* fleets (cf. *Fig. 4*). The building also houses offices and workshops, and provision has been made for an underground cell for the future testing of gas turbines.

B.O.A.C.'s base consists of four hangar pens in two pairs, each pen 340 feet by 144 feet, with workshops, offices and stores between the pens. It houses a large part of the Corporation's fleet and nearly all the technical departments and, altogether, nearly 4,000 people.

Pan American World Airways has a permanent steel single bay hangar for its *Stratocruisers* in No. 2 Maintenance Area and this area also contains a three-pen aluminium hangar, the first of its type to be built. — No. 3 Area is reserved for future development.

Equipment Round-Up

Antenna reflector group



Transmitter-receiver

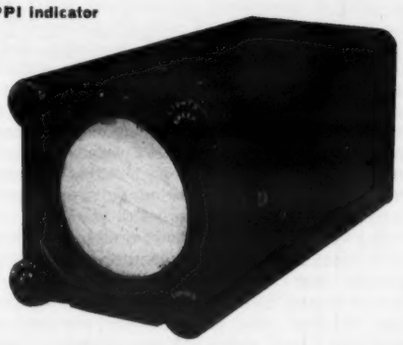
● **RCA, Los Angeles plant:** The AVQ-10 airborne storm and turbulence warning radar, which is fitted, for example, in the Lockheed **Super Constellation** and Convair **Metropolitan**, works in the C band, on a wavelength of approx. 5.5 cm and weighs a total of 125 lbs., excluding the shock mounting. The installation consists of five (or six) main components: transmitter-receiver, antenna, accessory unit, control panel, one (or two) PPI indicator unit.

The **transmitter-receiver** (weight 44 lbs.) provides an output signal of 75 kW peak power and 5,400 mc/s carrier frequency. Pulse width is 2 microseconds, pulse frequency 400 c/s. The **antenna group** (weight 25 lbs.) has a reflector of 22 ins., 30 ins., or 34 ins., as required. Horizontal beamwidth for the 22-in. reflector is 7° and scan rate is 15 r.p.m. Though normally aligned with the aircraft's longitudinal axis, the reflector can be tilted 10° upwards and 15° downwards. The **accessory unit** (weight 33 lbs.) contains circuits for synchronization, intermediate frequency and stabilization, also an ISO Echo Contour circuit which provides for a black picture to appear on the PPI when the signal return intensity reaches a preset level. Thanks to the latter feature, the pilot can detect zones of greatest turbulence from a long range and thus avoid them. The **control panel** (weight 2 lbs.) contains all switches and levers required for antenna setting, range selection, ISO echo contour operation, etc. The **indicator unit** (weight 13 lbs.) uses a 5-inch PPI tube with horizontal field of view and provides a " turbulence map ", with adjustable range, covering about three-quarters of the full circle about the aircraft. If required, the terrain ahead of the aircraft can also be reproduced in map form.

Accessory unit

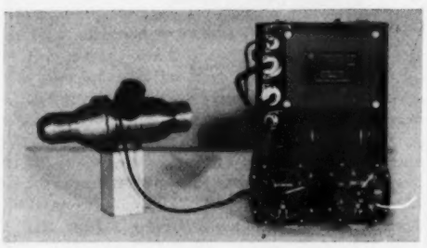
Control panel

PPI indicator



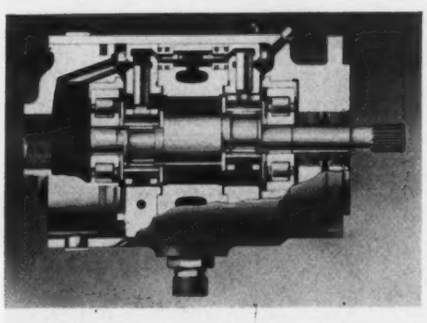
● **Ottico Meccanica Italiana,** Rome: At the Third International Electronics Congress in Rome, the firm of Ottico Meccanica Italiana introduced to trade circles an instrument, designed by Engineer Rafaello Nistri, which seems destined to relieve pilots of their constant anxiety as to their remaining range at any given moment. Known as the " residual range indicator " (Indicatore di autonomia residua per velivoli), the equipment is the result of five years' development work and is offered in two versions; I — as a residual endurance indicator (showing remaining flight time in hours and minutes); II — as a residual distance indicator (showing remaining range in kilometres, statute miles or nautical miles). In both cases range calculation is based on the engine performance set and the appropriate fuel consumption.

The residual endurance indicator (version I) consists of the following components: 1 — fuel flow meter with calibrated rotor wheel and impulse counter for rotor speed; 2 — electronic amplifier-transformer for the impulses from the flow meter; 3 — potentiometer for measuring fuel supply, which delivers a voltage corresponding to the remaining volume; 4 — measuring circuit (similar to a Wheatstone bridge) to calculate the quotient from fuel supply and consumption; 5 — indicator with micrometer to transfer the " error voltage " to the pointer (time reading); 6 — power supply.



In the range indicator (version II) these components are supplemented by the following: 7 — altitude-compensated dynamic pressure meter (with electrical output voltage) to measure true air speed; 8 — corrector to allow for wind components; 9 — indicator to show remaining range. — The prototypes of both versions have been subjected to extensive tests at Guidonia test centre.

● **Lockheed Hydraulic Brake Co. Ltd.,** Leamington Spa, England: Two of this firm's most important airborne hydraulic systems will be on show at the S.B.A.C. Exhibition in Farnborough: (1) the independent power boost system with Servodyne unit, and (2) a multi-purpose hydraulic system to operate undercarriage, landing flaps, dive brakes, nose wheel steering, etc. The latter equipment includes the Lockheed Mk. 8 hydraulic pump, shown here in section, which is fitted to the **Comet** 4 commercial jet transport.



● **Lockheed Aircraft Corporation** has recently begun using a new ultra-thin acrylic resin coating for metal parts to protect the surface from scratches and other damage during assembly. The coating is only thousandths of an inch thick and is as " hard as stone ". After final assembly a special remover is sprayed on the coat, which can be removed without difficulty 24 hours later.

● **Bell Automation Corporation,** Rochester, N.Y., a recently founded subsidiary of Bell Aircraft Corporation, of Buffalo, N.Y., is producing the Electro-Way electronically controlled weighing system for conveyor belt handling of materials. It can be used, for example, for checking the weight of jet engines after assembly.

● **The National Bureau of Standards** has developed a Microimage data storage and retrieval device, which provides rapid access to any one of 10,000 information-containing frames recorded in miniature on a 10-inch-square sheet of microfilm. Designed and built by M. L. Kuder, of the Electronic Instrumentation Laboratory, the device is intended for use in other Government agencies. — Information for reproduction may be in the form of pictures, drawings, fingerprints, sets of numbers, letters, or other symbols, or even single stages of electronic circuit diagrams. Quantity and kind of data is limited only by the size of the individual frame (1/10 ins. square) and the photographic resolution of the film emulsion. Input to the machine is from a perforated teletype tape containing the coded locations of the desired frames in the order in which they are to be printed out. The assembled data produced by the machine come out on a 10-inch wide strip of photo-sensitive paper of any required length. Individual frames are enlarged to ½-inch squares. Commercial automatic developing equipment processes the photographic paper.

● **Kléber-Colombes,** Paris, is now making the Altitherm heating mat developed by B. F. Goodrich in the United States. The mat consists of very fine wire networks embedded in rubber and is used for de-icing small aircraft surfaces.

● **Martin Baker** is working on an improved version of its Mark 4 automatic ejection seat which has already been selected for installation in the Hawker **Hunter Mk. 7** and the Fiat G. 91 fighters, as well as in the Fiat G. 82 jet trainer. Future refinements of the present design are expected to be efficient up to 1,000 m.p.h.

The Mind of Mr. Reader

Flight without weight . . . but heavy correspondence

Editors' Note : The article entitled " Towards Flight withouth Weight . . . " by Intel, Washington (Interavia, May 1956, p. 373 etc.) drew a flood of letters from readers, a selection of which is reproduced below. To all those who have asked us for the author's address we must reply that we do not feel authorized to reveal his identity ; we have, however, forwarded all such letters to him, to give him an opportunity of replying direct.

Sir,

Your own reserve as regards the contents of this article is understandable, although you will certainly be aware that not only pure experts but also scientists from other neighbouring domains have for decades been pointing to the possibilities described in this article. Are you acquainted with the work of Viktor Schauberger, who also arrived, I understand from his work on water flow, at the conclusion that gravity can be overcome by unusual methods ?

If I might express another wish, it would be this : I quite understand that the military side of aviation takes an important place in your magazine. But it seems to me to be time to give far more attention than hitherto to the human side in aviation. The problem, to my mind, is frequently expressed in too primitive a form. For example : what must be done in the way of training and selection to ensure that man meets the new flying requirements (centrifugal force. acceleration, air pressure, altitude sickness etc.) ?

Should not the first question be : what must we do, not do, invent, consider etc. so as not to harm the human being, and then what can be done technically within this framework ?

Heiligenhaus (Bez. Düsseldorf). Kurt HEINTZENBERG

1. The Editors are not acquainted with the writings of Viktor Schauberger on fluid flow research. When and where were they published, and under what titles ?
2. The human factor in aviation is never ignored by Interavia (cf. for example, No. 7. 1956, p. 500 etc. " Air Transport Safety Increases Twentyfold in Twenty Years "). The Editors plan to tackle the medical side of this question at a later date.

Sir,

In your May issue you published an article entitled " Towards Flight without Stress or Strain . . . or Weight ". I feel I may be doing you a service by pointing out that the main idea and the " information " contained in this article are copied from a science fiction novel published in America in 1935 and entitled " The Mightiest Machine ". The author was John W. Campbell. The ideas discussed in this novel have also been repeated in other science fiction works, for example in " 6me Colonne " by Robert A. Heinlein, published in French by Hachette a few years ago.

There are two possibilities :—either it (the 1935 book) was a truly extraordinary anticipation of events, of which there are several examples in the history of science fiction ;— or you have been the victims of a hoax.

Personally, I incline to the second hypothesis.

Paris Jacques BERGIER

The Editors would, of course, prefer the first hypothesis, but leave it to the author to reply.

Sir,

For many years now, I have been carrying on experiments in this line of endeavour as mentioned in your issue of *Interavia* (May) . . . Next year I will be graduating in Aeronautical Engineering . . . I would appreciate it very much if you could send me additional information of Mr. Townsend's work on the flying disc ; such as design characteristics, correspondence with Mr. Townsend and also a better method of charging the disc. I have been charging my discs with a Van de Graph static machine and four plate condensers ; however, I have been having trouble retaining the fixed charge.

Pomona, California James M. DEAN

The Editors have not tried anything in this line themselves. The request for T. T. Brown's address has been passed on to Intel.

Sir,

As an Airline Engineer I was very much interested in the article . . . Experiments by me, that started as a hobby to bear out or disprove my theory that " gravity " is not a pull or attraction as has long been taught but rather a resultant push, indicate a very promising avenue for further investigation. While my research has not been extensive as research work goes in this day and age I feel it should be explored further so I desire to contact workers in the field and feel that Author Brown or whoever he may be representing is such a worker.

Millbrae, California Herbert A. LEBERT

The American Townsend T. Brown is not the author of the article signed Intel. This letter too has been forwarded to Intel.

The true position

Sir,

Motto : Know Yourself

I was highly delighted with your article " Towards Flight without Stress or Strain . . . " in your May 1956 issue and also with the supplementary article " Albrecht Einstein and Gravitics Research " *(sic)*.

At last the scientific world is beginning to take seriously the invention of German engineer Lewetzow, which has been built by the Russians. The famous " flying saucers from outer space ", which have been carrying out weightless flight in Russia since 1945, are built on the principles described in your article.

What a disgrace for the intelligence of our times that we believed in " space ships from other planets ", like little children believe in the stork ! How stupid the " big nobs " of our age must think us, that they should pull that one on us !

When, about three years ago, at a lecture on " flying saucers " which contained the above nonsense, I stated the true position, the lecturer dismissed me curtly, and the gaping public did not notice how they were caught in his trap. And when I later ventured further explanations to a group of scientists, they treated me as if I were slightly " cracked ".

Are we Germans the only ones who are so stupid, as appears from the above, or is it the whole Western world ?

In that case we can only congratulate the Russians !

Ahnsen, nr. Bückeberg Schulz PILLGRAM

The attitude of your adversaries betrays complete ignorance of Albert Einstein's four equations of the universe, with the aid of which you can rout even the most stubborn " scientist ".

$$g_{ik;s} = 0, \qquad \Gamma_i = 0$$
$$R_{ik} = 0, \qquad R_{ik,l} + R_{kl,i} + R_{li,k} = 0$$

More pioneers in the jet flap field

Sir,

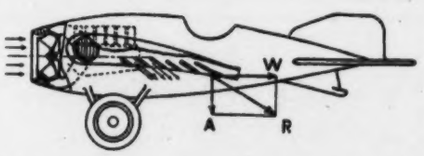
. . . Professor Valensi points out (issue No. 4, 1956, p. 293 — Ed.) that he used the Coanda effect on a slotted flap before Davidson. But here, too, there are predecessors in connection with jet power. The method of jet deflection in an aircraft with propulsive nozzles is illustrated in Fig. 8 of ZFM (Zeitschrift für Flugtechnik und Motorluftschiffahrt) No. 14, 1920 ; and a patent for a swivelling jet engine was applied for by Junkers in 1936. Actually, the application was later dropped, since a Siemens patent of 1892 recommended deflection of the jet through 90° sideways and downwards to control lift surfaces.

The use of the jet engine in conjunction with a wing flap and the control of the boundary layer by suction or blowing are protected by patents Nos. 768 044 and 768 072 (class 62b, group 404 and 3701) of October 1938 under my name for the firm of Junkers. — Even then we assumed that the possibility of influencing the boundary layer by blowing was already known, and that only the combinations of regulation for the jet engine, blowing slot section and flap setting could be patented.

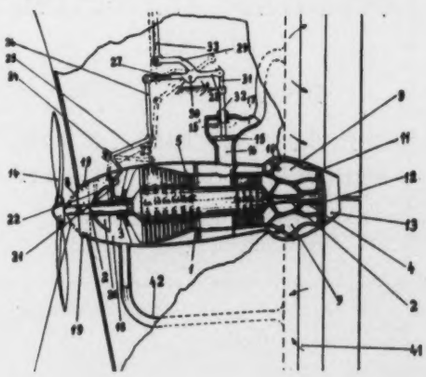
. . . If our present-day inventors would spend more time studying old scientific literature and old patents, none of them could claim to be the inventors of one of the twelve take-off or flight methods you list in No. 1, 1956, unless he had had the basic ideas involved before 1935 . . . A thorough study of the writings of our teachers shows repeatedly that we can be only an executing generation for the ideas of a very few really gifted men.

Cologne Dipl. Ing. M. A. MÜLLER

The following is an extract from No. 14, Vol. XI of "Zeitschrift für Flugtechnik und Motorluftschiffahrt":
" . . . In Coanda's aircraft . . . power was supplied by a 50 h.p. petrol engine ; instead of a propeller, however, a blower was used, namely a radial blower with stator and diffusors, whose pressure tube ended in a nozzle. The diameter of the nozzle was about 1 m . . . Instead of a large-section nozzle, it might be possible to install a number of small nozzles in the wing in such a way that the air emerging provides not only propulsion, but also a certain amount of lift. In this way the airfoil's lift could be increased. The air required would pass through the hollow wing, and suction be provided by nozzles on top of the wing . . . "



Extract from Junkers patent No. 768 072 :
" Patent claims : 1. Device to influence the boundary layer by suction and blowing of air in aircraft, in particular aeroplanes, which are equipped with a recoil power unit containing a multi-stage axial compressor with intermediate bleeding, characterized by the fact that the part of the axial compressor not involved in supplying air to the recoil engine at low altitudes of flight serves as delivery machine for the air to be sucked out of the boundary layer and blown into the boundary layer again at other points by methods already known . . . "



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Book Reviews

The Exploration of Mars. — By Willy Ley and Wernher von Braun, with paintings by Chesley Bonestell. — The Viking Press, New York, 1956 (English ; 176 pages ; price $4.95).

A variation on the favourite topic of the two authors (who, it should not be forgotten, made the first usable rocket motors) : "*How to get away from the earth ?*" This time their thoughts fly, not to the moon, but to Mars, which this year comes decisively nearer to our planet and thus merits " honourable mention " in the daily press and the writings of the space travel specialists. Like most works by space travel enthusiasts, this book is an exciting mixture of serious scientific work—the chapter on the history of Mars research is extremely readable —and poetic licence. True, the journey to Mars (2 years 239 days for the round trip) cannot yet be undertaken with the knowledge so far available ; but this entertaining excursion by two German Americans is obviously not intended as a " route handbook " but as a manifesto, a call to the young generation not to rest until man has imposed his will. He.

Indian Skyways Aviation Directory of Asia 1956. — Edited by R. Vaughan-Fowler. — Aeronautical Publications of India Ltd., Bombay, 1956 (English ; 227 pages ; price 10 rupees).

This handy-sized volume contains the most important addresses of military agencies and air transport authorities, as well as details of airports, other ground organization and the aircraft industry in India and other countries in the Middle and Far East (with the exception of China, North and South Korea and the Soviet Union). This information is supplemented by a chapter on Australia, a " Who's Who in Asian Aviation " and an alphabetical register. Ri.

Soviet Air Power. — By Richard E. Stockwell. Pageant Press Inc., New York, 1956 (English; XII+238 pages and 16 photo pages; separate appendix of tables ; price $7.50).

Wrong . . . is what my mathematics teacher wrote under every exercise whose result simulated greater accuracy than was warranted by the data on which it was based. The same remark must unfortunately be applied to the industriously compiled mixture of fact and fancy published under the title " Soviet Air Power ". The author is *far* too positive about details. He gives the exact span of Russian aircraft in feet and inches, as well as, of course, maximum speed, service ceiling, armament, etc. . ., but in many cases makes mistakes from the outset in the type designation or designer. The reader becomes even more distrustful of such " exactitude " when he comes upon the following passages, for example : " The Russians also got the HWK 109-509 rocket engine from the Walter plant near Prague, Czechoslovakia... (p. 116), or " with...Günter (Dr. Prof. Siegfried) now back in East Germany, we may expect to see an East German aircraft industry spring up " (p. 172), when everyone in the aviation world knows that the HWK engine was built by Professor Hellmuth Walter at Kiel (by the way, Walter now lives at Upper Montclair, New Jersey), and that Dipl. Ing. S. Günter is at present working with Heinkel in Stuttgart, West Germany.

Admittedly, the author was unlucky. His book came out just at the time when the Russians invited the world and his wife to Moscow and showed them some of their latest designs at Tushino. Books, and certain magazines, can no longer get away with " second-hand " information. Stockwell's book, however, does also contain accurate statements and analyses. Ri.

General View of Japanese Military Aircraft in the Pacific War. — Published for " Aireview " by Jin Imai, Kantosha Co. Ltd., ; Editor-in-Chief Kazuo Baba. — (Japanese ; 324 pages ; four tables of data).

The publishers explain that the object of this book on World War II is to show the younger generation that the Japanese aircraft industry produced efficient aircraft of its own design during the war, that were equal to those on the other side. The present volume is also a mine of information for the aircraft spotter. All Japanese wartime aircraft types are illustrated by photographs and three-view drawings, which are accompanied by technical data and brief descriptions. Ba.

Weyers Flottentaschenbuch, XXXVIII, 1954/55. Edited by Alexander Bredt, with drawings by Erich Gröner. — J. F. Lehmanns Verlag, Munich, 1955 (German ; 350 pages ; price DM 26).

The second post-war edition of this well-known German reference book on the navies of the world again gives condensed tables of data for all warships. This information is supplemented by nearly eight hundred scale drawings (scale 1 : 2,000), notes an armament and armour-plating, and a large number of photographs, which are grouped together with the drawings in the second part of the book. Like the first post-war edition (1953), which gave a survey of the German Navy's strength and losses between 1939 and 1945, the present volume also contains a historical portion, this time giving the warship losses of foreign fleets with details of date, place and nature of sinking, the most important technical data for the ships concerned and the output of the various countries. Of particular interest is the section on the former Japanese fleet, with drawings of the most important types of ships, in more comprehensive form than has hitherto been published elsewhere. Re.

Flugsicherung — Organisation und Betriebsverfahren. — By K. Möbius ; Volume 2 in the series " Die Bücher der Luftfahrtpraxis ", issued by Dr.-Ing. H. J. Zetzmann. — Hanns Reich-Verlag, Munich, 1956 (German ; 157 pages ; 28 illustrations ; one map ; price DM 8.80).

Written in the same pithy style as the first volume in the series (Bodlée " Motor und Segelflug " ; cf. *Interavia* No. 1, 1956), this compact little book by a recognized expert gives a concise but comprehensive survey of the organization and technical bases of modern air traffic control, its radio navigation aids and operating procedures. The strict classification of the material and an index of subjects make for rapid reference, and an alphabetical list of

definitions in both German and English still further increases clarity. In brief, a book which, in view of the importance of its subject-matter and its capable presentation, deserves the widest circulation. Ri.

Report on the Helicopter, The Helicopter and Its Role As a Transport Vehicle. — By Samuel C. Williams. Published in Series A-1 of the Brundage Story and Rose Research Reports. Distributed by Stevens Book Store, Stevens Institute of Technology, Hoboken, New Jersey, 1955 (English ; 200 pages ; price $2.50).

The author, for many years a consulting engineer and today Professor of Industrial Engineering at the Stevens Institute of Technology, discusses the future prospects of the helicopter from the economic and technical points of view. The main object of the research report was to investigate the uses of the helicopter—along with other means of transport—in both the civilian and military fields and to ascertain how far the helicopter or its logical development could become a mass means of transport. Without revealing all the conclusions reached, mention may be made of some of the points covered by the report : military requirements will remain the backbone of the helicopter business ; there is little prospect that the helicopter will be used as a private means of transport ; as the distance of major airports from city centres increases, helicopter taxi and feeder services should expand ; internal city helicopter services are unlikely to materialize without substantial subsidies. These conclusions are supported by a wealth of statistical material, which will interest in particular air transport circles. Re.

Solid Propellant Rockets. — By Alfred J. Zaehringer. — American Rocket Co., Wyandotte, Michigan, 1955, printed in manuscript form (English ; 162 pages ; price $4.00).

A general introduction to the field of solid propellant rockets, with extensive bibliography to each of the seven main chapters. The wealth of material to be treated has been condensed through the frequent use of tables ; and drawings by the author, as well as photographs, supplement the well-arranged text. New information is contained in particular in the two chapters on " Static Testing " and " Dynamic Testing ". The final chapter discusses the almost unlimited applications of solid propellant rockets. The author forecasts a promising future for hybrid rockets, i.e., combinations of solid and liquid propellant rockets and solid propellant rockets with ramjet duct, which promise particular advantages for long-range artillery rockets. Re.

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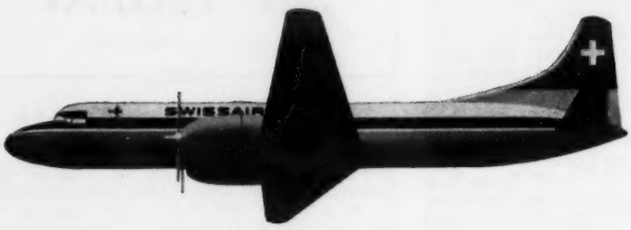

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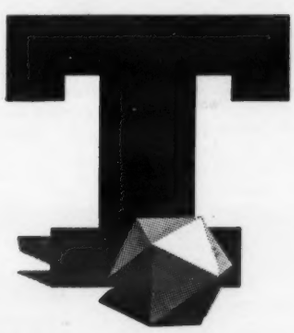

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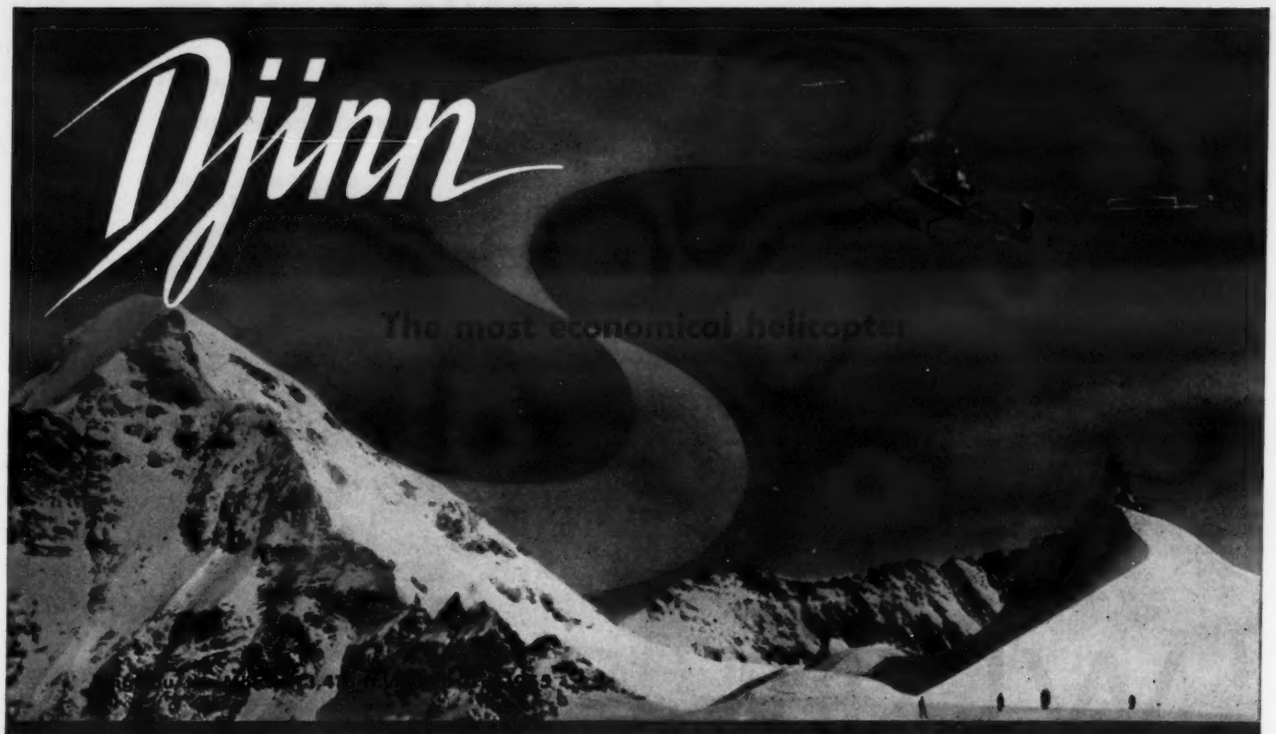

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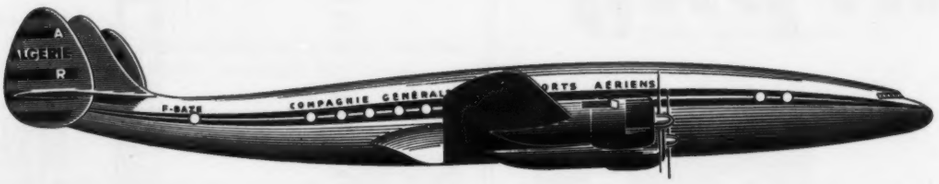

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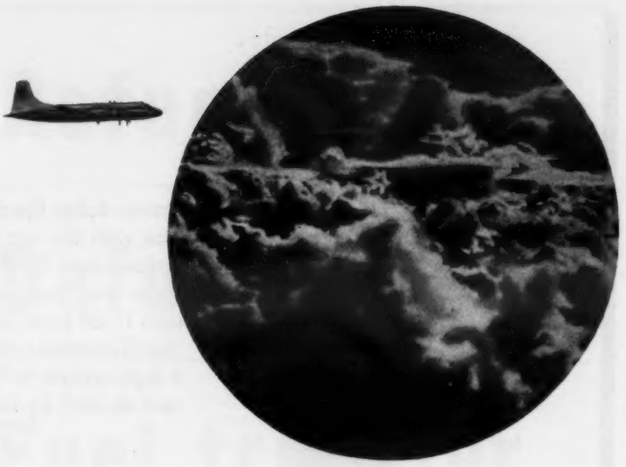

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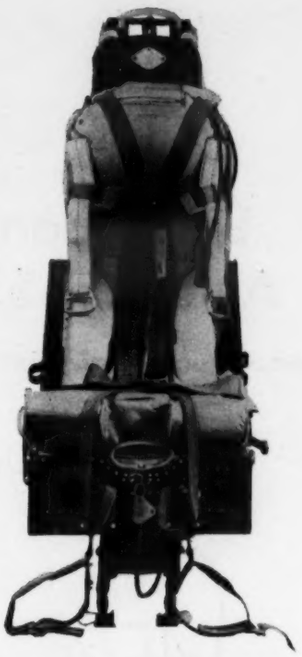

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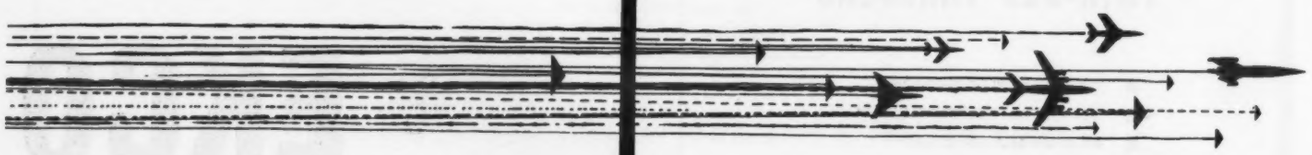

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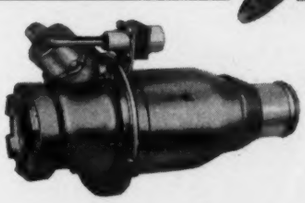

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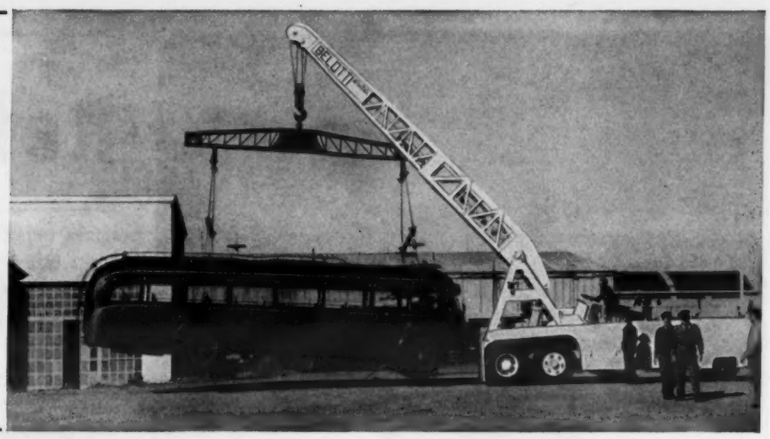

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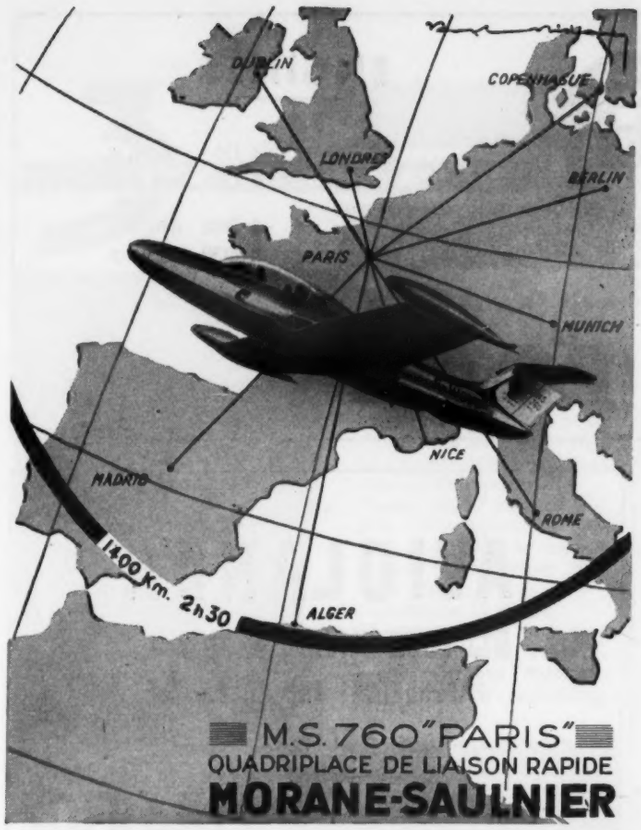

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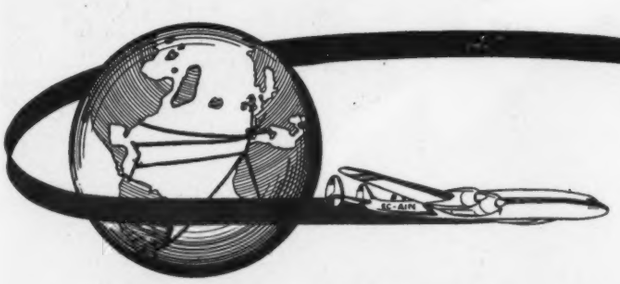

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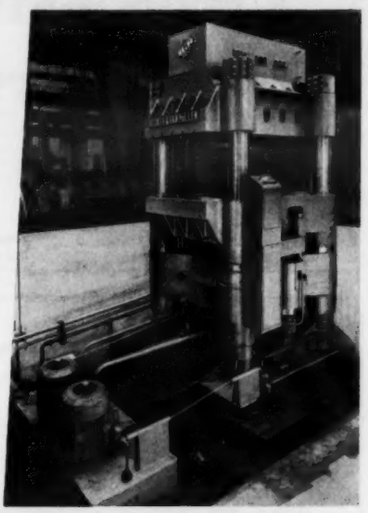

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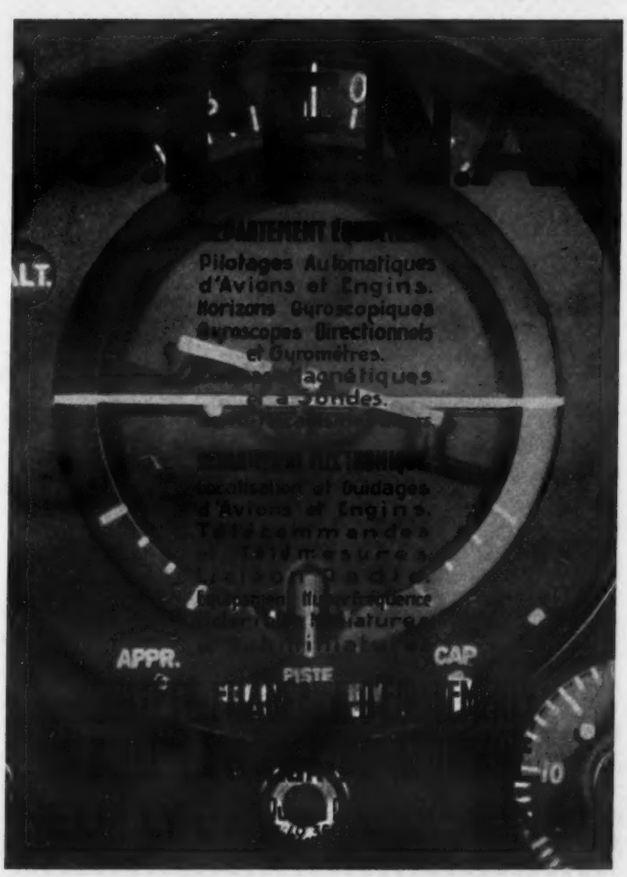

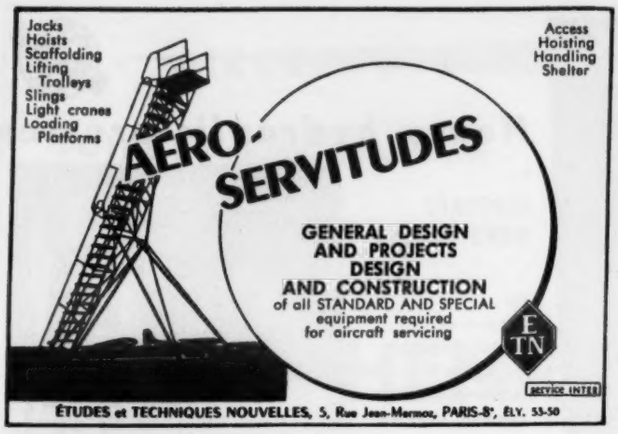

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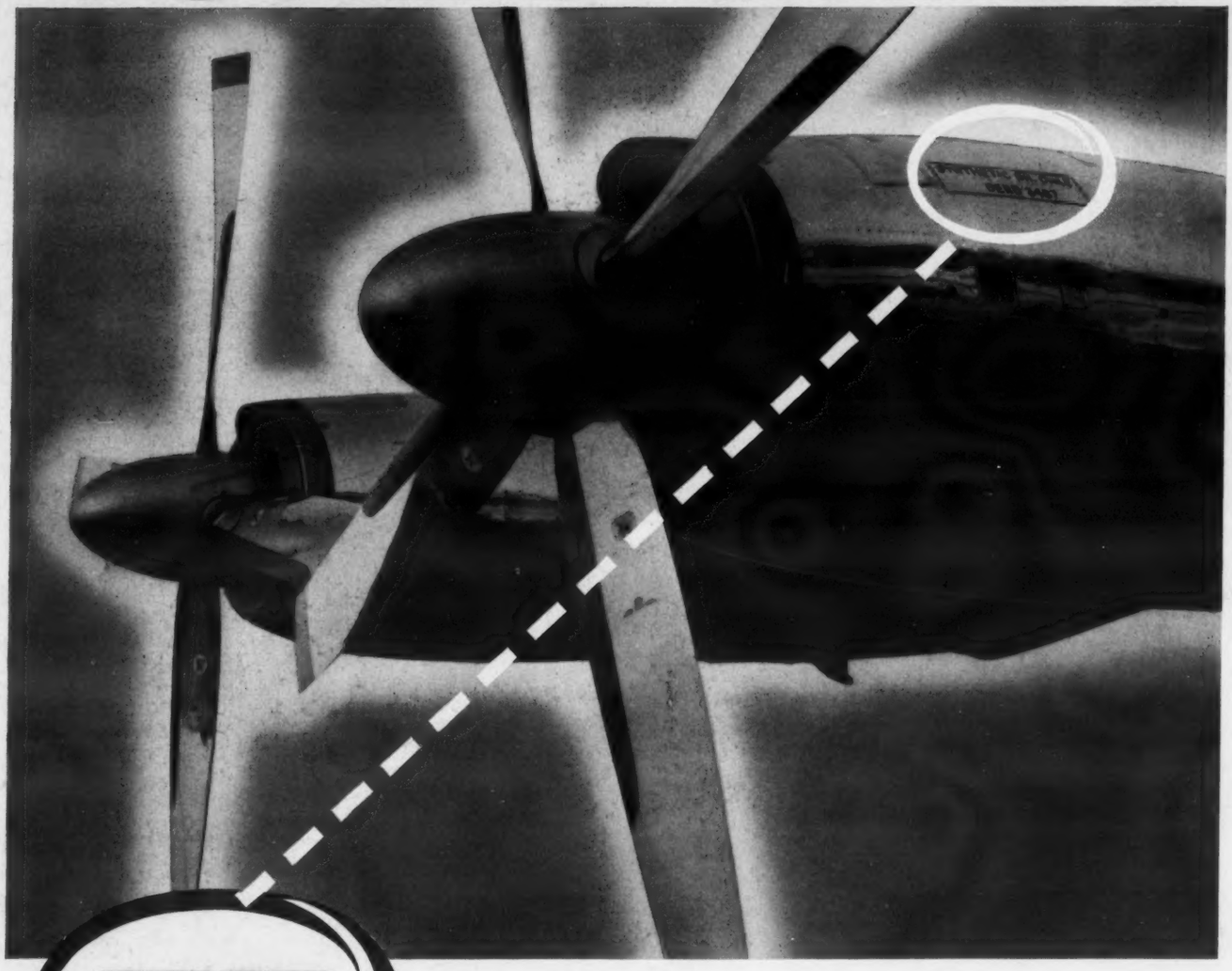

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